Chemical Age

CONFERENCE ON FLAMMABILITY OF TEXTILES (page 679)

VOL. 78 No. 1998

26 October 1957

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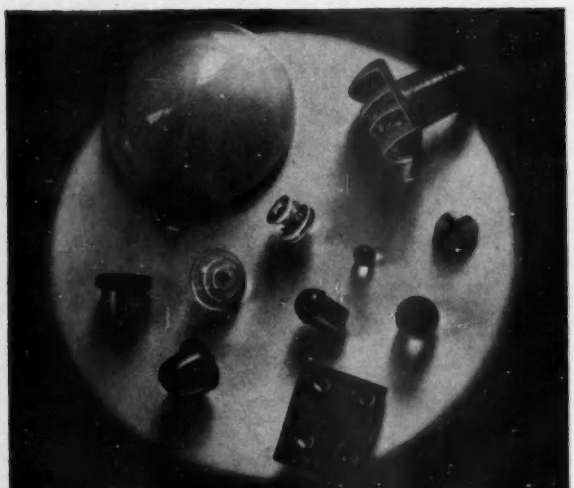

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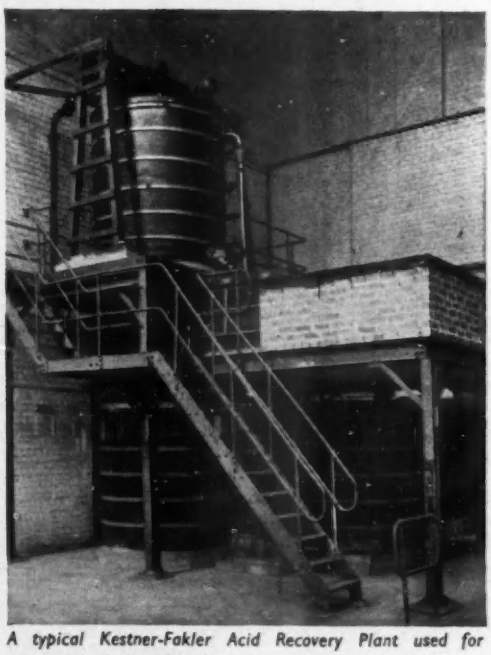

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INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
229	A.P.V. Co., Ltd., The	Front cov.
344	Acalor (1948) Ltd.	—
209	Accrington Brick & Tile Co., Ltd., The	—
176	Adequate Weighers Ltd.	—
	Aero Research Ltd.	—
223	Aimer Products Ltd.	—
159	Albany Engineering Co. Ltd., The	670
	Alexander, Herbert, & Co., Ltd.	—
165	Allen, Edgar, & Co., Ltd.	—
364	Alumina Co., Ltd., The	—
328	Amalgamated Oxides (1939) Ltd.	—
306	Armour & Co., Ltd.	—
G/Cd.	Ashmore, Benson, Pease & Co.	—
189	Ashworth, Arthur, Ltd.	—
	Associated Lead Mfrs. Ltd.	700
G/Cd.	Audley Engineering Co., Ltd.	—
146	Autometric Pumps Ltd.	—
212	B. A. Holland Engineering Co., Ltd., The	—
282	Baker Perkins Ltd.	675
324	Baker Platinum Division, Engelhard Industries Ltd.	—
233	Balfour, Henry, & Co.	—
210	Barclay Kellett & Co., Ltd.	—
	Bell, G., & Sons, Ltd.	—
250	Bennett, Sons & Shears Ltd.	—
G/Cd.	Berk, F. W. & Co., Ltd.	—
242	Beryllium & Copper Alloys (Safety Tools) Ltd.	—
	Bivac Air Co. Ltd.	—
270	Black, B., & Son, Ltd.	—
2	Blackman Keith Ltd.	—
204	Blundell & Crompton Ltd.	—
148	Borax Consolidated Ltd.	—
	Borax & Chemicals Ltd.	—
289	Boulton, William, Ltd.	—
228	Bowmans Chemicals Ltd.	—
270	Braby, Fredk., & Co., Ltd.	—
183	Bramigk & Co., Ltd.	—
	British Acheson Electrodes Ltd.	—
224	British Arca Regulators Ltd.	—
217	British Carbo Norit Union Ltd.	—
	British Ceca Co., Ltd., The	670
216	British Chrome & Chemicals Ltd. (London)	673
230	British Chrome & Chemicals Ltd. (Lancs)	—
	British Drug Houses Ltd., The	—
	British Geon Limited	—
8	British Industrial Solvents	—
236 & 237	British Laboratory Ware Association Ltd.	—
275	British LaBour Pump Co., Ltd.	—
240	British Lead Mills Ltd.	—
360	British Railway Traffic & Electric Co., Ltd.	—
Spine	British Resin Products Ltd.	—
172	British Rototherm Co., Ltd., The	—
227	British Steam Specialties Ltd.	—
168	British Tar Products Ltd.	—
	British Thomson-Houston Co. Ltd.	—
170	British Titan Products Co., Ltd.	—
397	Broadbent, Thomas, & Sons, Ltd.	—
231	Brotherhood, Peter, Ltd.	—
244	Brotherton & Co., Ltd.	—
	Brough, E. A., & Co., Ltd.	—
234	Browns Foundry Co., Ltd.	—
218	Brush Design Group, The	—
175	Bryan Donkin Co., Ltd., The	—
180	Buell (1952) Ltd.	—
272	Burnett & Rolfe Ltd.	—
	Buss Ltd.	—
	Butterworths Scientific Publications	—
201	Butterfield, W. P., Ltd.	—
160	Calder Vale Glassworks Ltd.	—
	Callow, F. E. (Engineers) Ltd.	—
	Callow Rock Lime Co. Ltd., The	—
354	Candy Filter Co., Ltd., The	—
	Cannon (G. A.) Ltd.	—
238	Carbon Dioxide Co., The	—
280	Carmichael, John R., Ltd.	—
243	Catalin Ltd.	—
	Chapman & Hall Ltd.	—
	Chemical Construction (Great Britain) Ltd.	—
191	Chemical Workers' Union, The	—
	Chemicals & Feeds Ltd.	666
318	Chemitrade Ltd.	—
284	Chesterfield Tube Co., Ltd., The	—
203	Ciech (Poland)	cov. iii
264	Cinema Television Ltd.	—
224	Clark, T. & C., & Co., Ltd.	—
	Classified Advertisements	698, 699, 700
258	Clayton Dyestuffs Co. Ltd., The	—
199	Clayton, Son & Co., Ltd.	—
288	Clydesdale Chemical Co. Ltd.	—
285	Clyde Tube Forgings Ltd.	—
213	Cole, R. H., & Co., Ltd.	—
208	Cole & Wilson Ltd.	—
204	Collins Improved Firebars Ltd.	—
	Colt Ventilation Ltd.	669
	Colvin-Smith Ltd.	—
348	Comet Pump & Eng. Co. Ltd., The	—
	Constable & Co.	—
	Controlled Convection Drying Co.	—
	Constructors-John Brown Ltd.	—
4	Crofts (Engineers) Ltd.	—
	Cromil & Piercy Ltd.	—
171	Cruickshank, R., Ltd.	—
334	Curran, Edward, Engineering Ltd.	—
304	Cyanamid Products Ltd.	—
222	Cyclops Engineering Co. Ltd., The	—
288	Cygnet Joinery Ltd.	—
286	Danks of Netherton Ltd.	—
216	Davey, Paxman & Co., Ltd.	—
	Dawson, McDonald & Dawson Ltd.	—
170	Derby Luminescents Ltd.	—
	Distillers Co., Ltd. The	—
161	Dorr-Oliver Co., Ltd.	—
280	Douglas, William, & Sons Ltd.	—
200	Dowlow Lime & Stone Co., Ltd., The	—
	Dring & Fage Ltd.	668
174	Drummond Patents Ltd.	—
195	Dryden, T., Ltd.	—
	Dunlop Rubber Co., Ltd.	—
	Dutt, P. K., & Co., Ltd.	—
232	E.D.C., Ltd.	—
330	Edison Swan Electric Co., Ltd., The	—
	Electric Resistance Furnace Co. Ltd.	—
268	Electronic Switchgear (London) Ltd.	—
244	Electrothermal Engineering Ltd.	—
B/Mk.	Elliott, H. J., Ltd.	—
	Emcer Products	cov. ii
	Enamelled Metal Products Ltd.	—
166	English Glass Co., Ltd., The	cov. ii
G/Cd.	Erinoid Ltd.	—
207	Evered & Co., Ltd.	—
	Evershed & Vignoles, Ltd.	—
	Fairey Aviation	—
280	Farnell Carbons Ltd.	—
	Fawcett Finney Ltd.	—
	Ferraris, Fred, Ltd.	—
202	Ferris, J. & E., Ltd.	—
	Fleischmann (London) Ltd.	—
220	Film Cooling Towers (1925) Ltd.	—
253	Foxboro-Yoxall Ltd.	—
	Foxflex Ltd.	—
	Fraser, W. J., & Co., Ltd.	—
298	Fuller's Earth Union Ltd., The	—
188	Gallenkamp, A., & Co., Ltd.	—
	Gas Council, The	—
266	Geigy Pharmaceutical Co., Ltd.	—
	General Electric Co., Ltd.	—
	Glebe Mines Limited	—
	Goodyear (Export Div.)	—
290	Graviner Mfg. Co., Ltd.	—
265	Grazebrook, M. & W., Ltd.	—
164	Greeff, R. W., & Co., Ltd.	—
192	Grindley & Co., Ltd.	—
232	Hackbridge & Hewittic Electric Co., Ltd.	—
202	Haller & Phillips Ltd.	—
214	Hanovia Lamps	—
	Hanson Books	—
206	Harris (Lostock Gralam) Ltd.	697
222	Haworth, F. (A.R.C.) Ltd.	—
158	Hearson, Charles, & Co., Ltd.	—
238	Herbert, Alfred, Ltd.	—
	Hickson & Welch Ltd.	—
193	Holroyd, John, & Co., Ltd.	—
234	Honeywill & Stein Ltd.	—
248	Hopkin & Williams Ltd.	—
187	Humphreys & Glasgow Ltd.	—
310	Huntington, Heberlein & Co. Ltd.	—
310	I.C.I. Billingham Organic	667
	I.C.I. General Chemicals Solvents	—
	I.C.I. Plastics—Darvic	—
	I.C.I. Plastics—Fluon.	—
	I.C.I. Ltd., (Plastics Div.) Corvic	—
	I.C.I (Florube) Ltd.	—
	Imperial Chemical Industries Ltd.	—

continued on page 668

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248

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
157	Imperial Smelting Corporation (Sales) Ltd.	—
	Industrial & Marine Protective Applications Limited	—
	Industrial Tapes, Ltd.	—
	International Combustion Group	—
	Isopad Ltd.	—
246	Jackson, Henry (Liverpool) Ltd.	—
214	Jackson, J. G., & Crockatt Ltd.	—
245	Jenkins, Robert, & Co., Ltd.	—
249	Jenkinson, W. G., Ltd.	—
3	Jobling, James A., & Co., Ltd.	—
	Johnson, S. H., & Co., Ltd.	—
166	Johnsons of Hendon Ltd.	—
267	Jones, Tate & Co., Ltd.	—
228	K.D.G. Instruments Ltd.	—
178	K. W. Chemicals Ltd.	—
	Kaylene (Chemicals) Ltd.	—
278	Kernick & Son Ltd.	—
395	Kestner Evaporator & Engineering Co., Ltd.	cov. ii
395	Kestner Evaporator & Engineering Co., Ltd. (*Keebush*)	—
	Kestner (Industrial Safety) Ltd.	—
	Key Engineering Co., Ltd., The	—
283	Kier, J. L., & Co., Ltd.	—
271	Kleen-e-ze Brush Co., Ltd.	—
206	Lankro Chemicals Ltd.	—
210	Laporte Chemicals Ltd.	—
184	Lavino (London) Ltd.	—
252	Leda Chemicals Ltd.	—
264	Leek Chemicals Ltd.	—
162	Leigh & Sons Metal Works Ltd.	666
	Lennig, Charles, & Co. (Great Britain) Ltd.	—
	Lennox Foundry Co., Ltd.	—
219	Light, L., & Co., Ltd.	—
274	Lind, Peter, & Co., Ltd.	—
Cover	London Aluminium Co. Ltd., The	—
	Longman Green & Co., Ltd.	—
278	Lord, John L., & Son	—
190	Machinery (Continental) Ltd.	—
	MacLellan, George Ltd.	—
	Mcgraw Hill Ltd.	—
257	Mallinson & Eckersley Ltd.	—
	Manesty Machines	—
342	Marchon Products Ltd.	—
226	Marco Conveyor & Eng. Co. Ltd.	—
168	Matthews & Yates Ltd.	—
	May & Baker Ltd.	—
173	Measuring & Scientific Equipment Ltd.	—
	Meigh Castings Ltd.	—
Cover	Metal Containers Ltd.	—
	Metafiltration Co., Ltd.	671
G/Cd.	Metalock (Britain) Ltd.	—
174	Metcalf & Co.	—
	Metropolitan-Vickers Electrical Co., Ltd.	—
178	Middleton & Co., Ltd.	—
	Mills Packard Construction Co., Ltd.	—
215	Mine Safety Appliances Co. Ltd.	—
	Mirrlees Watson Co. Ltd., The	672
180	Mirvale Chemical Co., Ltd.	—
254	Mitchell Cotts & Co., Ltd.	—
	Mond Nickel Co., Ltd., The	—
	Monsanto Chemicals Ltd.	676
	Morgan Crucible Co., Ltd., The	—
200	Moritz Chemical Engineering Co., Ltd.	—
	Mulberry Co., Ltd., The	—
181	Neckar Water Softener Co. Ltd.	—
268	Nederlandse Emballage Ondeernemming Gebr. de Wilde N.V.	—
221	Negretti & Zambra Ltd.	—
	New Metals & Chemicals Ltd.	—
	Newnes, George Co., Ltd.	—
276 & 277	Newton Chambers & Co. Ltd.	—
239	Nicolson, W. B. (Scientific Instruments) Ltd.	—
177	Nordac Ltd.	—
211	North Thames Gas Board	—
194	Northern Malleable Foundry Co., Ltd., The	—
179	Northey Rotary Compressors Ltd.	—
	Nu-Swift Ltd.	—
	Orr Products Ltd.	—
296	Palfrey, William, Ltd.	—
	Paper Good Manufacturing Co., Ltd.	—
	Pascall Engineering Co. Ltd., The	—
6	Paterson Engineering Co. Ltd., The	—
287	Peabody Ltd.	—
	Penrhyn Quarries Ltd.	—
	Pergamon Press	—
320 & 368	Permutit Co., Ltd., The	—
G/Cd.	Petrocarbon Developments Ltd.	—
	Petrochemicals Ltd.	—
	Polypenco Ltd.	—
340	Pool, J. F., Ltd.	—
	Pott, Cassels & Williamson	—
358	Powell Duffryn Carbon Products Ltd.	—
G/Cd.	Power-Gas Corporation, Ltd., The	cov. iv
169	Price Stutfield & Co., Ltd.	—
	Prodorite Ltd.	—
242	Production Chemicals (Rochdale) Ltd.	—
	Prudential Assurance Co. Ltd., The	—
261	Pye, W. G., & Co., Ltd.	—
	Pyrethrum Board of Kenya	—
	Q.V.F. Ltd.	—
314	Reads Ltd.	—
	Rediweld Ltd.	—
	Richmond Welding Co., Ltd.	—
	Robinson, F., & Co., Ltd.	674
G/Cd.	Rose, Downs & Thompson Ltd.	—
230	Rotometer Manufacturing Co. Ltd.	—
167	St. Helens Cable & Rubber Co. Ltd.	—
269	Sandiacre Screw Co. Ltd., The	—
182	Scientific Glass-Blowing Co., The	—
285	Shaw Petrie Ltd.	—
255	Sheepbridge Alloy Castings Ltd.	—
356	Shell Chemical Co., Ltd.	665
256	Siebe, Gorman & Co., Ltd.	—
350	Sigmund Pumps Ltd.	—
	Simon, Richard, & Sons, Ltd.	672
344	Southern Instruments Computer Division	—
338	Spencer Chapman & Messel Ltd.	—
	Stabilag Co., Ltd., The	—
396	Stanton Instruments Ltd.	—
	Staveley Iron & Chemical Co. Ltd.	—
212	Steel, J. M., & Co., Ltd.	—
	Steel & Cowlishaw Ltd.	—
	Stockdale Engineering Co., Ltd.	670
	Stonehouse Paper & Bag Mills	—
	Streamline Filters Ltd.	—
	Sturge, John & E., Ltd.	—
251	Sutcliffe Speakman & Co., Ltd.	—
279	Taylor Rustless Fittings Co., Ltd.	—
235	Tenaplas Sales Ltd.	—
218	Thermal Syndicate Ltd., The	—
196	Thomas & Bishop Ltd.	—
	Thomason, W., & Sons Ltd.	—
145	Thompson, John (Dudley) Ltd.	—
	Todd Bros. (St. Helens & Widnes) Ltd.	—
198	Towers, J. W., & Co., Ltd.	—
197	Trent Valve Co., Ltd.	—
160	Tungstone Products Ltd.	—
259	Unifloc Ltd.	—
	Unilever Ltd.	—
	United Coke & Chemicals Co. Ltd.	—
247	United Filters & Engineering Ltd.	—
	United Kingdom Atomic Energy Authority	—
	Vaughan Crane Co., Ltd.	—
192	W.E.X. Traders Ltd.	—
241	Walker Extract & Chemical Co. Ltd.	—
	Wallach Bros. Ltd.	—
263	Waller, George & Son Ltd.	—
161	Walley, A. L.	—
162	Wallis, Charles, & Sons (Sacks) Ltd.	—
	Ward, Thos. W., Ltd.	—
185	Watson, Laidlaw & Co., Ltd.	—
	Weinrebb & Randall Ltd.	—
260	Wells, A. C. & Co., Ltd.	—
182	Wengers Ltd.	—
217	Whessoe Ltd.	—
	Whiffen & Sons Ltd.	—
196	Whitaker, B., & Sons Ltd.	—
163	Widnes Foundry & Engineering Co., Ltd.	—
	Wilkinson, James, & Son, Ltd.	—
186	Wilkinson Rubber Linatex Ltd.	—
273	Willcox, W. H., & Co., Ltd.	—
194	Williams, & James (Eng.) Ltd.	—
172	Wilson, Edward, & Son Ltd.	—
268	Wilde, Gebr. De Nederlandse Emballage Ondernemming N.V.	—
220	Wood, Harold, & Sons Ltd.	—
184	Worcester Royal Porcelain Co., Ltd., The	—
	Worthington-Simpson Ltd.	—
281	Wynn (Valves) Ltd.	—
225	Yorkshire Tar Distillers Ltd.	—
226	Zeal, G. H., Ltd.	—

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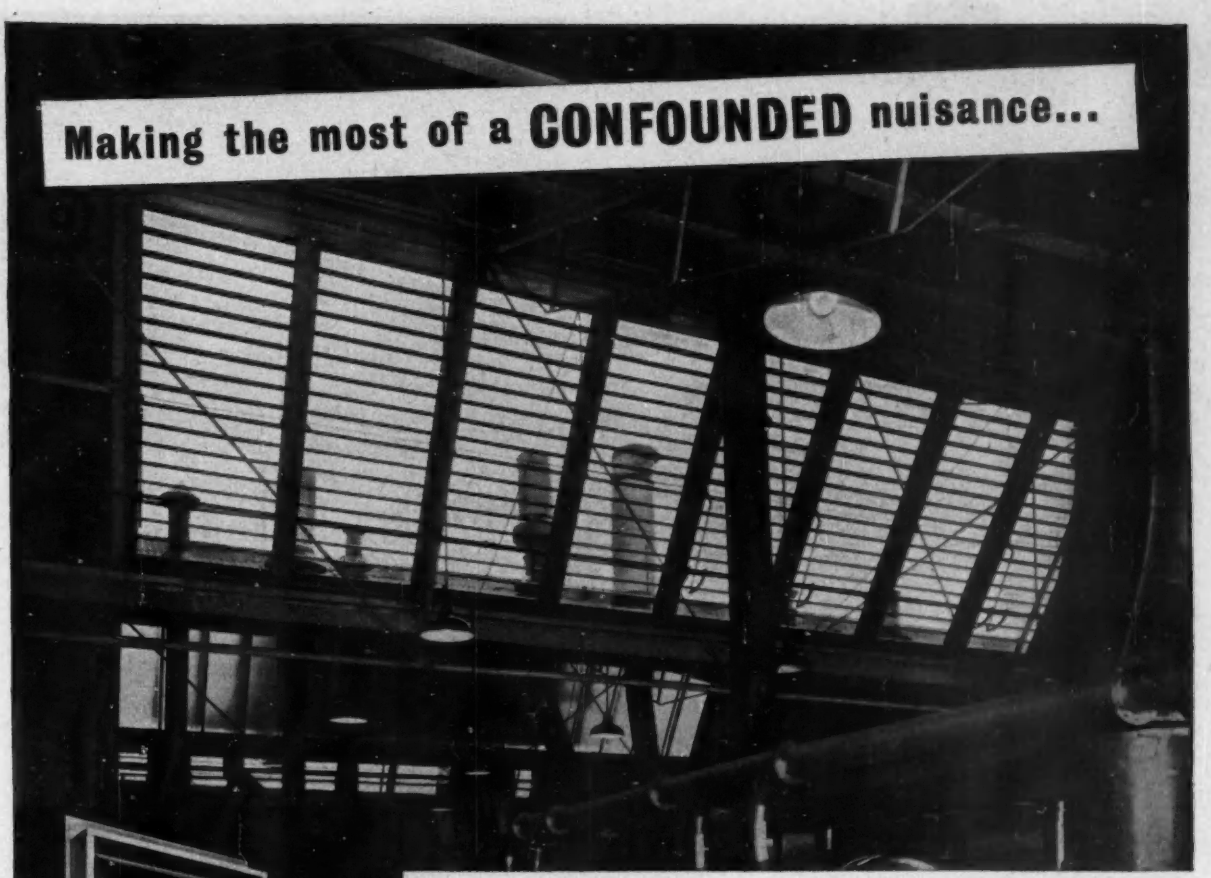

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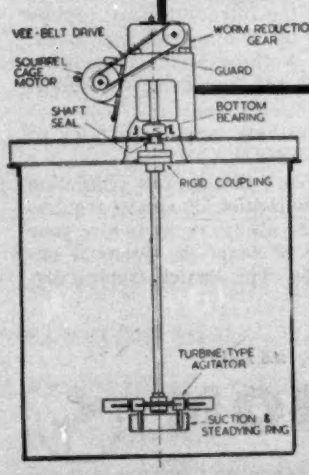

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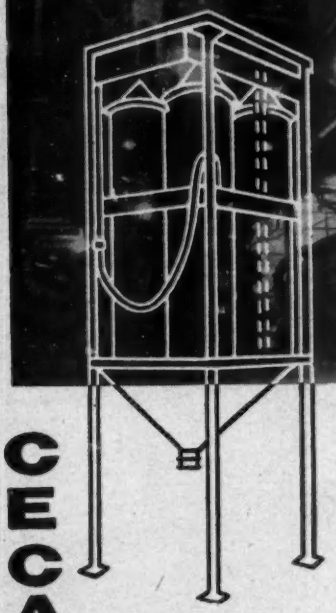

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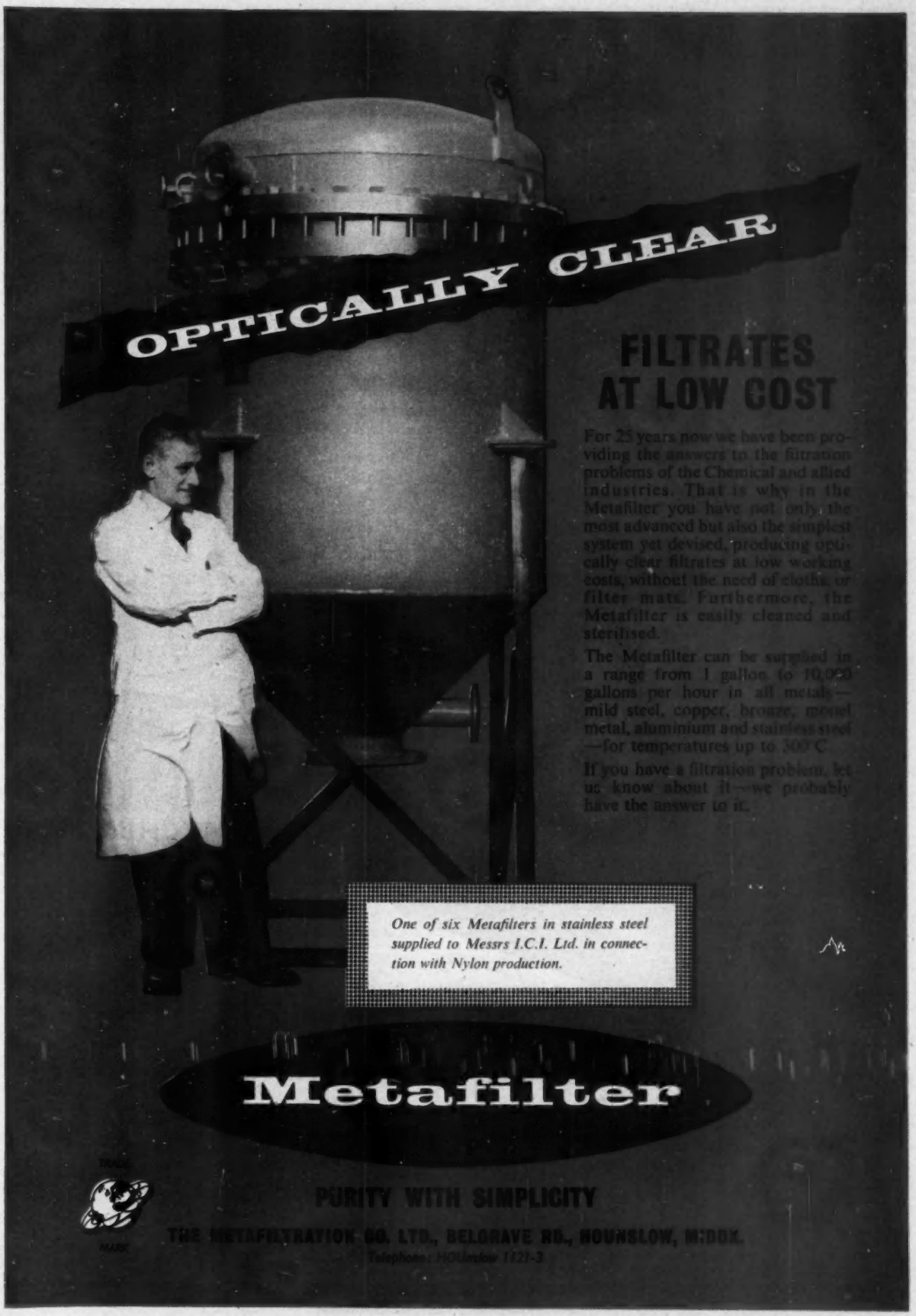
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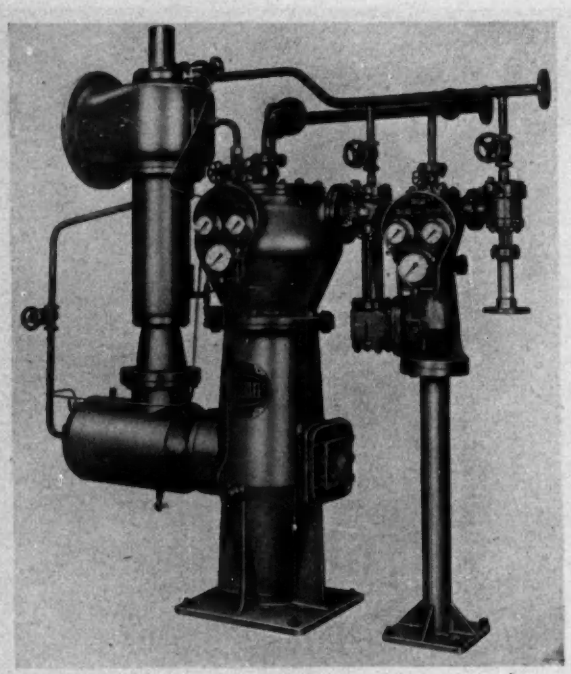

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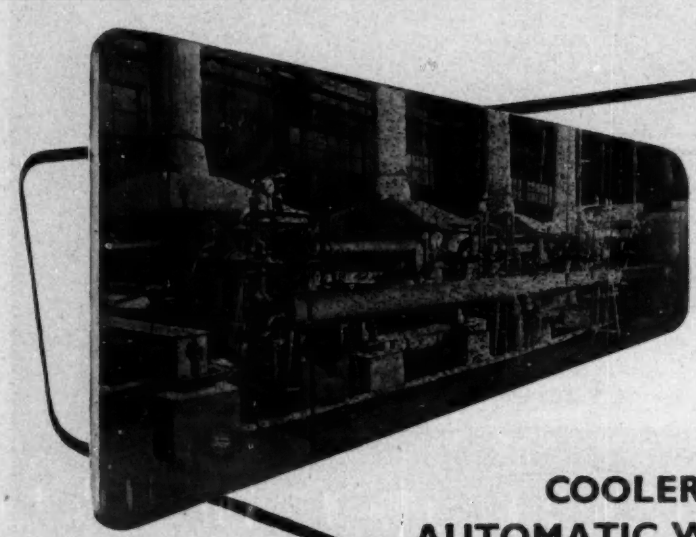

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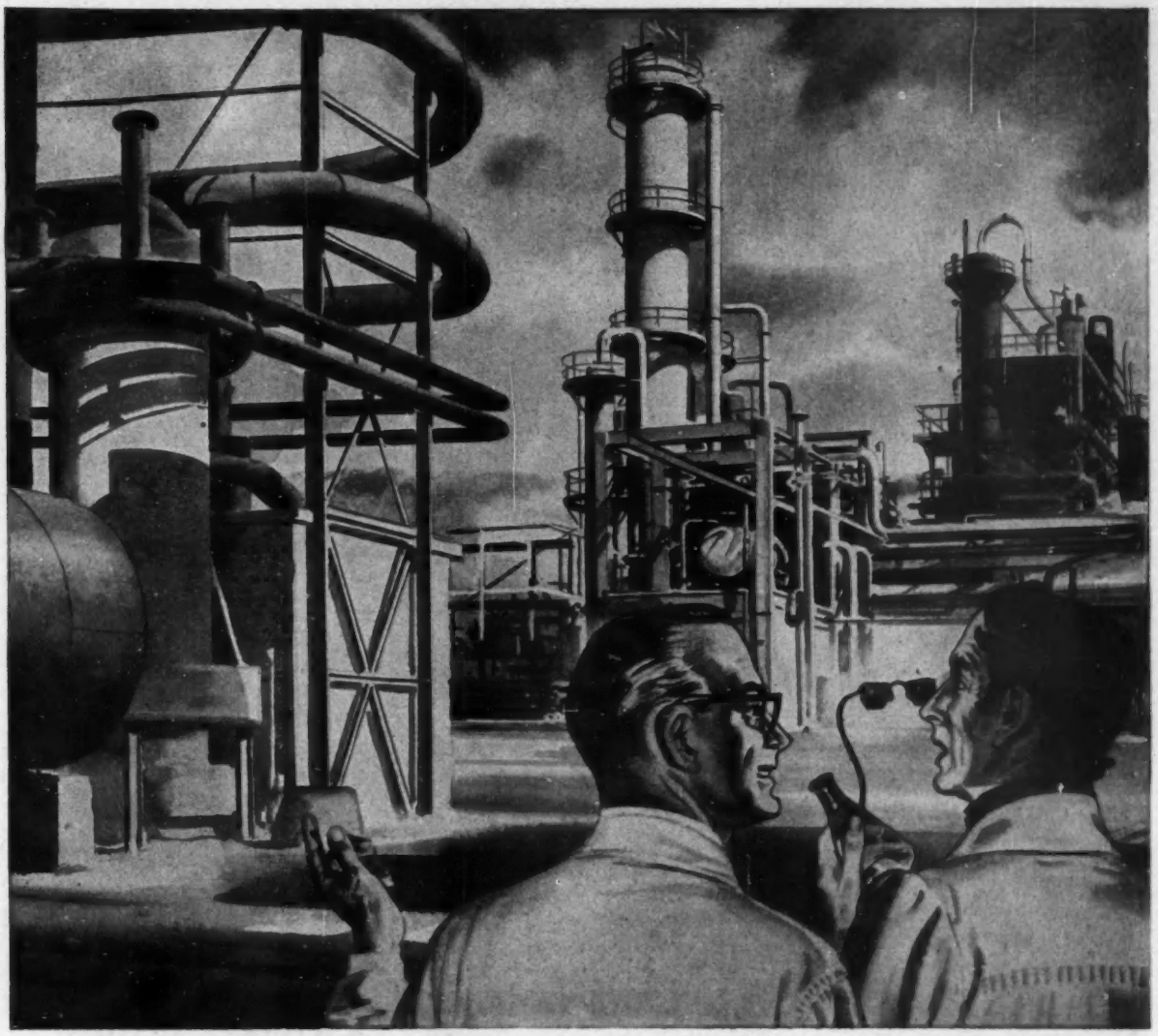

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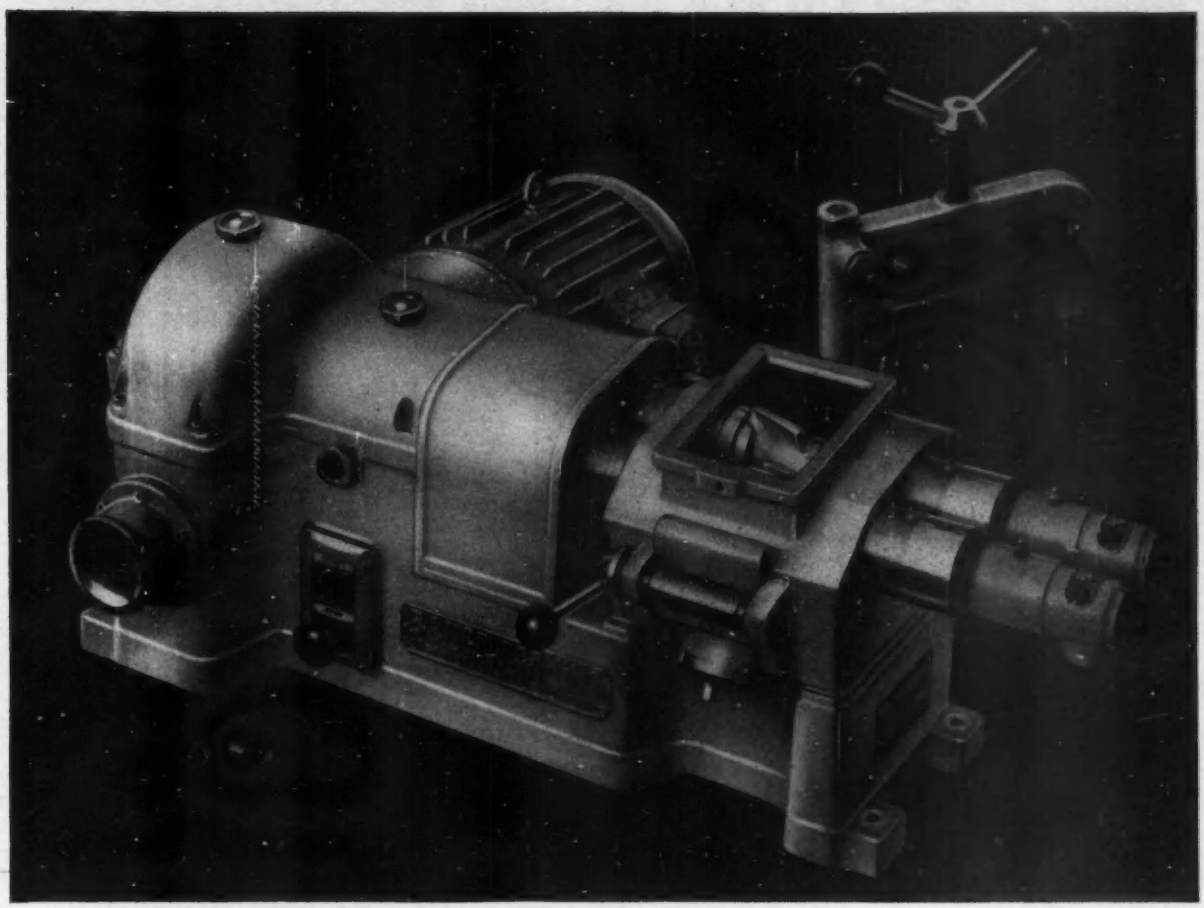

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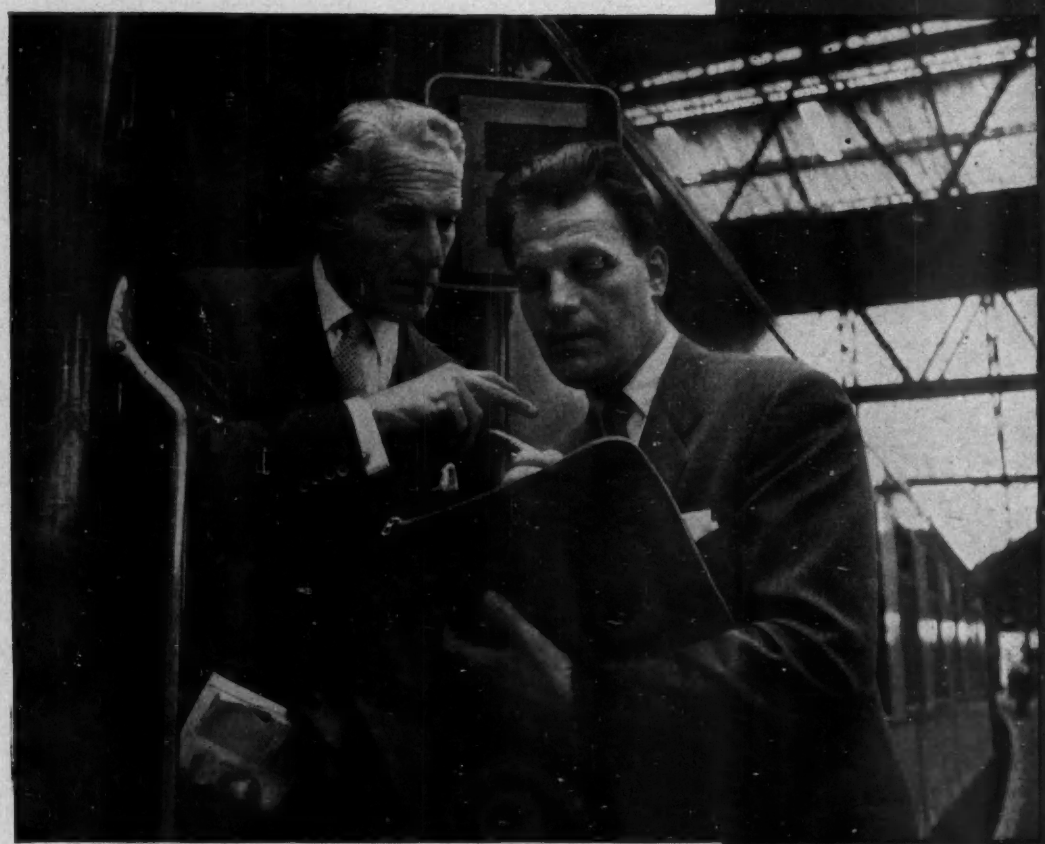

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IN THIS ISSUE

Deacon Process Revival?	678
Flammability of Textiles Symposium	679
Mobil Oil's Coryton Laboratories	681
Distillates	682
Colouring Matter in Food	683
BCIRA Annual Report	683
Fongra Produtos Chemical Plant	684
Plastics Sales Increase	684
Copper Sulphate's Competitive Market	685
Chemical Inspectorate's New and Amended Specifications	685
US Titanium from Oxide Process	686
Corrosion Convention and Exhibition	687
Corn Syrup Analysis	688
Overseas News	689
Chemical Pioneers—Walter Weldon	691
People in the News	692
Commercial News	693
Market Reports	693
British Chemical Prices	694
Chemical Stocks and Shares	695
For Your Diary	696
Trade Notes	696
Publications Received	696
Patents	697

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CHEMICAL AGE

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HEAVY WATER PLANTS

INTEREST in the construction of nuclear power reactors is worldwide and associated with such reactors is the importance of heavy water as a nuclear moderator, for it is four times as effective as graphite. Preference has been shown by all countries for natural uranium reactors and plentiful supplies of economical heavy water would be an additional impetus to these.

Use of heavy water is already planned for nuclear power plants to be set up by the US Cardina-Virginia Nuclear Power Association, Atomic Energy of Canada Ltd., Swedish State Power Board, and the Swedish Atomic Energy Co. The experimental boiling water reactor at Argonne National Laboratory is to change over for heavy water testing next year and the Wolverine Electric Co-operative at Hersey, Michigan will use heavy water to transport soluble uranium fuel in aqueous homogeneous reactor systems. In all, heavy water is planned to be used in some 10 or 11 power reactors throughout the world as well as in more than 20 research reactors.

Such power reactors will require 100–200 tons of heavy water, as one to two lb. of heavy water are required for each kilowatt of electrical capacity. As there is no loss of moderator during operation of the reactor initial supplies may last indefinitely.

It is of interest to note the US Atomic Energy Commission's sales of heavy water during 1956. Costing $28 per lb. sales amounted to $5 million. This year, 28.5 tons have been shipped to Sweden and 11 tons to Australia. The Euratom countries which are estimated to require 15 million kilowatts of nuclear-derived electricity by 1967 together with the UK's five to six million kW. by 1965 will therefore form a large potential market for heavy water.

Heavy water is undoubtedly a very important product for the future. It is considered potentially of value to fission processes, but it is as an important energy (deuterium) source that its future exists. For although hydrogen can be used as a fusion fuel, deuterium requires a much lower reaction temperature.

How then will or is industry taking up the challenge? There would seem to be enough information available to assist private industry in deciding on a suitable economic route for commercial production of heavy water.

In the US, for instance, heavy water secrets were declassified on 1 February last. Among these is a patent application made in 1950 by Jerome S. Spevack and classified by AEC. Spevack, however, filed suit and gained a court order restraining AEC from divulging his patent until he had had time to make applications for foreign patents on process improvements. His method outlined in patent 2,787,526 (issued 2 April and assigned to AEC) uses dual-temperature exchange. This is the first stage and increases deuterium oxide concentration in water from its naturally occurring 0.014 to 0.015 per cent up to 15 to 20 per cent. The crude product is then distilled (D_2O has a boiling point of 101.4°C) until the concentration reaches 90 per cent. The third stage is effected by electrolysis when final purification to 99.8 per cent is obtained. Stage one is the most important and requires 90 per cent of both capital and operating costs.

Spevack's improvements use deuterium exchange between hydrogen sulphide and water. High temperature favours deuterium-rich sulphide, and lower temperatures promote enrichment of water. Natural water and hydrogen sulphide run through a hot tower (about 100°C); deuterium in the water

exchanges with hydrogen in the sulphide to produce an enriched sulphide. Next the sulphide and water are run through a heat exchanger and a cold tower (25°C) thus reversing the equilibrium and causing the water to be enriched by the high-deuterium containing sulphide. Further such cycles are continued until the water contains enough D_2O concentration for distillation.

According to US sources, Spevack's improvements are most probably concerned with process control which has been mentioned as a difficulty. Heat efficiencies are important for operating costs as also corrosion control and safety engineering.

That the method has proved economical can be judged by AEC's selling price of $28 per lb. Operating costs of $15 per lb. are claimed by AEC. During the second world war, with maximum production rate of 15 tons a year, operating costs were $110 per lb. Present US capacity figures are not available, although it is known that Spevack estimates that an economical plant should be 50 tons a year, built at a cost of $7.5 to 10 million. Operating cost for making the heavy water, Spevack says, would be 10 to 20 per cent below AEC's figure of $15.

It will be recalled that the heavy water plant at Rjukan, Norway, of Norsk Hydro, destroyed during the last war, produced 1.7 tons a year of heavy water as a by-product of hydrogen generation for production of 100,000 tons a year of ammonia. Deuterium recovery by nickel-catalysed H_2—H_2O exchange produced heavy water costing $50 per lb.

In June this year, one of Japan's major fertiliser manufacturers, Showa Denko Co., started an experimental heavy water plant with a capacity of 50 kg. D_2O per year. This is substantially the same process as the Norwegian one. In the first stage D_2O in natural water is concentrated to 2 per cent by combined electrolytic and H/D isotope exchange process. This stage is built into the electrolytic plant of the company's ammonium sulphate facilities. In the second stage D_2O is enriched to 30 to 35 per cent by rectification. A heat pump is stated to keep operating costs low. Final enrichment to 99.3 per cent is achieved by electrolysis in cells claimed to have greater efficiency than those used in the US.

Further production trials are to be undertaken by Showa Denko before the company goes ahead with its proposed 10-ton a year plant. The economics of low temperature fraction of H_2/D_2 (principle of the Hoechst process) and straight hydrogen isotope exchange over a catalyst (principle of the Pintsch-Bamag process) are to be investigated.

In Germany the Federal Minister for Atomic Affairs recently awarded a research contract to Pintsch-Bamag for further development of their process; the process will be based on work during the last war at I G Farben's Leuna works. A pilot plant will be built this year at Pintsch-Bamag's Butzback works, but it is not known what the capacity will be.

Farbwerke Hoechst's 6-ton a year plant employs hydrogen distillation. This method has been investigated in the US by hydrocarbon research but despite the company's estimates that heavy water could be made for $16 per lb. the method had not been developed. Hoechst costs for D_2O from their plant are stated to be in the $100 per lb. range.

Russia's first experimental power station is known to use heavy water as both moderator and thermal exchange medium. Two heavy water pilot plants were built at the end of the '40s to test the hydrogen sulphide H/D and the ammonia H/D isotope exchange techniques. Basic design data for these was available from international sources and was presumably supported by German specialists.

It is believed that Russia possesses two production plants; one has a yearly capacity of about 60 tons, uses the hydrogen sulphide process and gives an enrichment of about 5 per cent. Final concentration to 99.8 per cent D_2O is via the electrolytic route.

The second plant uses the ammonia process but its capacity is not known, although 30 to 40 tons has been suggested. Russia's production is therefore around 100 tons of heavy water a year and should be sufficient for her atomic energy programme. It is known from the announcement last year by the Czech Minister of the Chemical Industry that a heavy water plant is to be built in Czechoslovakia.

In France Cie Francaise de l'Eau Lourde—a joint venture of Office National Industrial de l'Azote and Air Liquide—has a heavy water pilot plant which first made deliveries last January. A further French project by Société pour l'Obtention du Deuterium, is in the preliminary planning stages. This company plans to manufacture heavy water using deuterium exchange between normal water and the hydrogen sulphide in Lacq gas.

Eighteen months ago, Asea of Sweden (the electricity company) reported that they had worked out a semi-works scale process for heavy water in association with the Royal Technological Institute in Stockholm. Asea have said that the estimated price for large scale manufacture would be rather less than $28 per lb.

Norsk Hydro of Norway, back in production, also announced about a year and a half ago their contract price for heavy water. This was three times the $28 per lb. which the US has just announced for friendly nations.

Two years ago Montecatini of Italy stated that they had a contract from the Italian Energy Commission to build a plant at Larderello using thermal energy from the hot vapour springs (of volcanic origin) there.

As will be noted, on p. 682, Imperial Chemical Industries Ltd., during the war years worked out full-scale flow sheets and designs for a heavy water processing plant, although this was never built. It is presumed that any heavy water plant in this country would be set up by the UK Atomic Energy Authority.

DEACON PROCESS REVIVAL?

THE age-old Deacon process is again being investigated as a means of producing chlorine from by-product hydrogen chloride. In the original process hydrogen chloride and air passed over copper chloride at a high temperature produced water vapour and chlorine, albeit a very dilute chlorine gas. The process proved inefficient and has long been obsolete. But the economic advantage of producing chlorine with attendant caustic soda as a by-product has undoubtedly renewed interest in methods of oxidising hydrogen chloride.

A recent report indicates that Technical Enterprises Inc., of New York, US, together with Air Reduction Co., have been carrying out investigations on the Deacon process. In one case oxidation has been carried out using air and in the other instance, using oxygen.

It is recorded that one ton a day of chlorine can be produced by the modified process. Cost per ton of chlorine on a 100-day plant is said to be $15 (£5 approximately) with capital costs of $1.35 million (£450,000). Cost of chlorine in a 10-day plant is put at $43 (about £14.3) per ton with capital costs of $350,000 (£116,000 approximately).

Some three years ago East German concerns were using the Deacon process on a large scale because of their shortage of chlorine. Hydrochloric acid was being obtained in large quantities as a by-product from processing potash foots from the East German potash industry. These foots contain a great deal of magnesium chloride which is heated to obtain magnesium oxide, used by the building industry. This processing gave rise to hydrogen chloride.

Elsewhere hydrogen chloride is being obtained as a by-product which could be better used to provide chlorine. If the modified Deacon process now being investigated by Technical Enterprises Inc. can produce chlorine at the prices stated, it would seem that the process holds out considerable hope as a means of utilising by-product hydrogen chloride to produce chlorine economically.

FLAMMABILITY OF TEXTILES

Progress Outlined at One-day Conference

Speakers at the conference grouped together are, left to right: D. I. Lawson (Joint Fire Research Organisation, Borehamwood); Prof. C. S. Whewell (Leeds University); J. S. Ingham (Marks and Spencer Ltd); W. S. Sondhelm (Ashton Bros. and Co. Ltd.); F. Ward (Courtaulds Ltd., Bocking); A. F. W. Coulson (R. Greg and Co. Ltd.) and Dr. T. H. Morton (Courtaulds Ltd., Bocking). They are seen discussing one of the test pieces used in Mr. Ward's paper

DIFFICULTIES of devising suitable flammability tests for textiles, factors influencing flammability, implications of flameproofing, were the subjects of papers read at the one-day conference on 'The Flammability of Textiles' organised by the Manchester and District Branch of the Textile Institute and held at the British Rayon Research Association, Heald Green, Manchester, on 15 October.

Safety Testing Methods

WHEN he spoke on 'Standard testing methods', Mr. F. Ward, of Courtaulds Ltd., reviewed the requirements of suitable tests. He said that at least two types of test were required: one for determination rate, and another to determine whether the fabric would support its own combustion, i.e. was flameproof.

The speaker, by practical experiment, showed difficulties in determining a method of test. It was difficult, for instance, to measure the length of the flame. Probably the best-known tests were the American Federal and the vertical flame speed tests.

Mr. Ward observed that in the US there had been keen interest because of a series of unfortunate accidents which involved children and which involved certain types of raised fabrics. However, these fabrics, to the best of his knowledge, were not manufactured in this country.

In the US, since these accidents, the decline in production of these fabrics and the consequent fall in the accident rate had probably resulted in what was now comparatively little interest being shown in the subject of flameproofing by the Americans.

The point to be considered, said the speaker, was that they had to devise a test as to how readily a fabric may burn and ignite. So far the US was the only country which had a law in relation to flameproofing of textiles, although New Zealand and Australia were contemplating it. There seemed to be little interest in this particular field, however, in the US at the present time.

It was very important that any test should be carried out in conditions which had some relation to the end use of the material. Because it was difficult to measure the flame in what would seem to be an ideal position—i.e. vertical—it had been decided to have an angle test. The difficulties inherent in an angle test were those of holding the fabric without interfering in any way with the test itself. For this reason, the holding of the fabric between clips, similar to a stenter, had been found preferable to resting it on what was in effect a small wire ladder.

Accordingly 'U' shaped clips were used. In the US the angle of test appeared to have been chosen arbitrarily, but it had been found that the results could vary according to the angle of test.

Discussion: Mr. D. I. Lawson discussed the various tests in relation to fibres such as nylon (i.e. the plastic fibres) and observed that it was possible for the droppings, instead of falling away, to be held on the fabric unless one had the right angle, and as a result one would tend to obtain a flame-resistant rating which was too low generally.

Flammability Factors

DISCUSSING 'Factors which influence the flammability of textiles', Dr. T. H. Morton (Courtaulds) Ltd., dealt with the dependence of flammability on (i) fibre (ii) fabric and yarn type (iii) fabric weight and (iv) special finishes.

Raised fabrics, Dr. Morton observed, were intrinsically dangerous. In the US this matter had been brought to the notice of the public by an alarming number of accidents connected with a certain type of raised fabric which was not produced in this country at all. These fabrics had a tendency to burn very quickly when the flame was initiated by a surface flash.

For the past 70 years a considerable amount of chemical work had been done on a flameproof finish which was permanent and wash-proof for cotton and later, on viscose rayon. The work had really started with Perkin about 1890.

Referring to certain chemical finishes which had appeared to be the answer at one time, Dr. Morton instanced several which reacted with soap according to the amount used.

There were, therefore, three main permanent processes at present on the British market which in his opinion were, at any rate, satisfactory from the flameproof point of view and also these were durable. They were Proban, Lifeguard and Anti-Flam. These were reasonably permanent and should survive any household washing. They were not perfect but they did a job and he believed they would make a contribution to the problem which exercised them all.

Discussing ratings, Dr. Morton said that a fabric with a flammability rating of, say, 30–40 was not more safe than one with, say, 20–30 rating. It was dangerous to draw divisions and his view was that they should all be regarded as flammable and dangerous. When, of course, they considered a rating of 30–40 and one of 150, it was possible to make a division with assurance, but between 20–30, 30–40 he did not think it safe to suggest one was less flammable than the other.

Discussion: Mrs. N. McLauchlan (MP for Ulster West) said that non-technical people present must all have been impressed with the amount of work which had been done by the textile industry in trying to solve this problem. She pleaded for publicity and education through schools and teachers to draw attention to the problem.

Propagation of Glow

Dr. J. Preston (British Enka) asked if any work had been done by Dr. Morton in respect of propagation of glow. An instance was given of a cotton pile carpet and another of a rug and in each case fortunately the affair was discovered. In both cases the trouble had been traced to glow.

In reply Dr. Morton said that the trouble was what did one do about glow. If one insisted upon glow prevention one was faced with having a flameproof finish which had a small amount of afterglow. Personally he thought it a reasonable solution.

In regard to the cotton pile fabrics, a cotton pile would burn but did not glow, normally. He felt that perhaps there was something exceptional about that particular example.

Requirements for flameproofing

In a consideration of the 'Implications of flameproofing', Mr. J. S. Ingham, M.Sc., F.R.I.C. (Marks and Spencer Ltd.), said that it was only now, after a vast amount of work had been done on the subject, that a solution was in sight.

Styling of the garment played an important part. He felt that consideration should be given to this just as much as to the fabric. For example, pyjamas for children resulted in less accidents than nightdresses. His company did not now sell nightdresses for little girls—they sold only pyjamas for children.

Discussing the requirements of a fireproof finish from the point of view of permanence and wear, Mr. Ingham said that they were not yet satisfied that there was a suitable treatment on the market for this type of cloth which would combine permanence to washing during the life of the garment, and wearability. Special reference was made to softness of handle. Mr. Ingham suggested that perhaps publicity had been a little premature so far as treatments of this type of cloth were concerned.

The increased selling price of flameproof garments was mentioned by the speaker, particularly in respect of children. His company, however, did not think that any price increase would be a deterrent to sales provided that the treatment was all right. In the group 65 years of age, price might be a factor, as the majority of these people were old age pensioners. The selling price of a lady's garment may at present be increased by as much as 50 per cent.

In some detail, Mr. Ingham discussed flared-out dresses, industrial cloths and curtains. He considered that the permanent proofing of industrial cloths and curtains was quite reasonable both from a point of view of handle, appearance and properties.

Discussion: One speaker said that he thought it should be made clear that despite the work now going on, for the next 10 to 20 years the main cotton apparel fabrics would be untreated.

Mr. B. L. W. Smith of the Bleachers' Association wondered if consideration had been given towards a tie-up with the British Launderers' Research Association, because might there not be a possibility of the laundries putting on a flameproof finish each time, just as they now laundered? In other words, for paying a little extra, this finish could be imparted by the laundries. This would be a means of overcoming a good finish which might not be permanent.

Mr. Ingham said that this was, of course, a possibility and one which should be considered. But would the public pay the extra which would be required?

Mr. H. Pickering of Reckitt and Colman Ltd., said that launderers today were finding public resistance to prices and any further price increase, even for a finish such as had been described, might mean that the majority of the public would continue to have garments laundered without any flameproof finish. Indeed, he felt that the majority of people would not pay the extra to have the laundries add this finish.

True Perspective

In a brief summing-up, Professor C. S. Whewell of Leeds University, said that he agreed it was important to have the fire hazard in true perspective. The conference, he thought, had done a good thing because for the first time they had had made public some of the results of many years of research.

The enormous amount of work being done in chemistry in regard to flameproofing indicated that a solution was not far away. He stressed the significance, however, of producing a finish which was fast to washing.

Bearing in mind the present position, and the work being done, one could visualise a flameproof finish which was cheap and which did not impair the handle of the fabric being produced within 10 years, and he personally thought that the chances of a really first-class proof of this kind being obtained within the next five years were 'enormously high'. Professor Whewell considered that the many chemists at work in this field would gain much encouragement from the conference.

W. R. Hermes (The Yorkshire Dyeware and Chemical Co. Ltd.); H. Bellis (Sir Thomas and Arthur Wardle Ltd., Leek) and A. Murray (Yorkshire Dyeware and Chemical Co. Ltd.)

Fison's New Fertiliser Plant on Stream Next Year

Fisons' new fertiliser plant at Stanford-le-Hope on the north bank of the Thames, is expected to be in production by the autumn next year. Under terms of an agreement with Shell, Fisons Ltd. will take the equivalent of 60,000 tons of ammonia a year and convert this into nitrogen products primarily for use in the manufacture of compound fertilisers.

Work on the administrative and service buildings is said to be progressing satisfactorily and the construction of foundations for the main process units has started.

Consultants for the project are Brian Colquhoun and Partners. Site preparation was carried out by James Miller and Partners. The civil contract has been awarded to Sir Lindsay Parkinson and Co., and plant construction will be undertaken by Constructors John Brown Ltd., the main contractors for Chemical and Industrial International Ltd., who have designed the process plants.

Revised BS for Manholes and Inspection Openings

The British Standard concerning manhole and inspection openings for chemical plant has been revised at the request of the joint standardisation committee of the British Chemical Plant Manufacturers' Association, and the Association of British Chemical Manufacturers. Now known as BS 470: 1957, it revises the first edition issued 25 years ago and incorporated into the Factories Act of 1937, and deals with manhole openings, hand holes and inspection holes for chemical plant and for mobile tanks for chemicals.

The dimensions for manholes are grouped under the three specified shapes: oval, rectangular and circular. Those for hand and inspection holes are grouped under two shapes: oval and circular. Bold type in the dimensional tables denotes manhole sizes required by the Factories Act, section 27 (i) (a) for vessels in which dangerous fumes are liable to be present. It is pointed out that these requirements in no way hamper the freedom of users or manufacturers in the selection of the most appropriate designs. The Standard concludes with an appendix which lists British Standards in which the number and positions of manholes, etc., are laid down. Copies are available from the British Standards Institute, Sales Branch, 2 Park Street, London W1, price 3s.

British Viscometry Standard

British Standard 188, 'Determination of the viscosity of liquids in c.g.s. units' has been revised for the first time since 1937. It was first published in 1923 to encourage the expression of viscosity in c.g.s. units rather than in arbitrary units depending on the instrument.

Both capillary and falling sphere viscometers are described. For completeness, a description of the Cannon-Fenske capillary viscometer, used mainly in the US, has been included. The reverse-flow U-tube viscometer is now specified for measurement of the viscosity of opaque liquids.

Water is now the sole reference liquid and every capillary apparatus is to be directly or indirectly calibrated against water at 20.00°C. The method of calibration, using master viscometers and a 'step-up' procedure, is described.

Copies of the standard may be obtained from British Standards Institution, Sales Branch, 2 Park Street, London W1.

Zirconium Preparation as Antiperspirant

In patent No. 770 007, Thomas Hedley and Co. Ltd. give details of preparations for use as antiperspirants. The patent describes (1) the chloride, bromide, iodide or nitrate of zirconium or hafnium or oxysalt or a mixture of the two with, (2) a basic aluminium mixture, (3) an amino acid in the molecule of which there is an amino group and a carbon atom and (4) water.

This combination is stated to produce no irritation, does not spoil textile materials, and is easily worked. It can be either prepared in cream, solid or liquid form.

Mobil Oil Co.'s New Coryton Laboratories

The new technical services laboratory of Mobil Oil Co.

A NEW technical services laboratory at Coryton has now been completed for the Mobil Oil Co. Ltd. The laboratory will cover product development, quality control and technical service to marketers, distributors and manufacturers. Previously the laboratory was located at Wandsworth, London, with a section of the staff in temporary premises at Coryton. No fundamental research is carried out in the laboratory; the research department of Socony Mobil Oil Company Inc. in New York undertakes this type of work.

The new building was designed by S. Greenwood, A.R.I.B.A., and built by John Laing and Sons Ltd. The needs to be met in the design were for a compact building, necessary for the close liaison and interdependence of all the working groups, and a 'flexible' building, because the emphasis on different ranges of product varies from time to time. The building also had to be capable of expansion, and to provide good working conditions for up to 100 staff at a cost of not more than £10 per superficial foot, including services and facilities.

Engine Test Beds

Floor area is approximately 25,000 sq. ft. and most of the floor and roof slabs are designed to take a loading of 100 lb. per sq. ft. The engine test beds, situated at the end of the rear wing, are constructed in seven mass concrete blocks each weighing 20 tons, supported on spring suspension units to reduce sound transmission. Provision has been made for the installation of further beds, although there are smaller ones which are located at the rear of the front wing. Permanent partitions in the test beds are constructed in brickwork with metal acoustic tiles to walls and ceilings.

Work at the technical services laboratory includes the adaptation and reformulation of new and existing products introduced to this country, and readjusting the manufacturing specifications according to the properties of the raw materials of the supply sources. These vary from time to time and from country to country. As products have also to be reformulated to keep in line with the changing needs of the market, they are continuously tested to make sure they will withstand the strain imposed by new working conditions. Before a new and reformulated product can be manufactured for sale, much performance evaluation work is carried out in the laboratory, supplemented by tests in the manufacturing plant and field trials at customers' plants.

A service to assist marketers and distributing companies in solving any field problems is also provided by the laboratory; in addition approximately 200 samples per week are received from the field for routine testing. These samples are drawn from ships, industrial plant and automotive equipment all over the country, and sometimes abroad. The laboratory will also establish manufacturing specifications for the refinery and the two manufacturing and blending works at Birkenhead and Wandsworth.

Further technical service is given to Coryton Refinery, much of this work being the assessment of the effect of process variables on product quality by means of semi-pilot plant scale equipment. Development of analytical techniques to speed up manufacturing control testing is another feature of the laboratory's work.

Examples of improved test method development work include sodium nitrite in grease, rapid chlorine method for lubricating oils, sodium plumbite in doctor solution, lead content and reaction of lead greases, iron in percolation clay.

Room No. 8, a spectrographic room, houses a Hilger and Watts automatic large quartz spectrograph with its associated photographic darkroom and equipment to read the spectrograph plates. It is used at the present time mainly for the semi-quantitative analysis of the inorganic (mainly metallic) constituents of oils, greases, sludges, deposits, etc., in which function it provides considerably greater convenience and speed when compared with normal chemical methods of analysis.

Development work is in hand to extend the use of the equipment by developing quantitative methods of test.

Work carried out on process investigation is concerned mainly with lubricating oils where such processes as furfural extraction, solvent dewaxing and clay percolation are involved.

US Process for Protection of Mild Steel

PROTECTION of mild steel against corrosion at low cost is the claim of New York Testing Laboratories, US, for its nickel alloy coating process—Niphos. The coating is a mixture of green nickel oxide and dibasic ammonium phosphate in water. The mixture is sprayed, painted or dipped on to a base surface which has been degreased and prepared for coating by pickling. The coating is air dried and then the treated part is fed continuously on a wire-mesh belt through a furnace at 1,650°F upwards in which a reducing atmosphere—e.g. hydrogen, is maintained.

The nickel and phosphorus are reduced by the heat and hydrogen to elemental form, combining to produce a low melting eutectic (m. pt. near 1,600°F) containing 98 per cent nickel and 2 per cent phosphorus. According to the company, this alloy bonds with the iron base metal, to form a ternary alloy at the interface. So strong is the bond that it will withstand a bend of 180° without flaking or peeling. The coating is described as bright and non-porous, and from one to two mils thick. Extra layers can be added if required.

Corrosion testing has not been completed but samples have resisted salt spray exposures up to 100 hours and dilute sulphuric acid and hydrochloric acid solutions. Fair resistance to nitric acid solutions at room temperatures has been observed.

So far the Niphos process has been used on mild steel piping for the holds of oil tankers. Other applications are chemical plant piping systems, and heat exchangers.

The sample inspection laboratory at Coryton, where technical service samples are tested.

★ DETAILS of how industry co-operated with the Government in atomic projects up to 1946 have recently been disclosed. Mr. D. R. Willson of the UK AEA Atomic Energy Research Establishment has told of the vital contribution made by the universities and industry.

Europe's first metallic uranium was made at Widnes by the ICI general chemicals division in 1942. At the Witton plant of the metals division this was being experimentally rolled, extruded and forged under conditions of secrecy. Workmen at the time were amazed that they could not lift billets measuring 7 in. in diameter and 8 in. long. This was not surprising for they weighed 200 lb.

The metals division also carried out the first UK trials on sheathing uranium bars with aluminium. Membrane development was another of its responsibilities; after much experimental work they produced the membrane which is today used in the diffusion plant at Capenhurst. Billingham division of ICI concentrated on engineering research and development for the project. They also worked out full-scale flowsheets and designs for the heavy water process; the plant was never built because of the decision to use graphite in the British piles.

The work at Widnes was first supervised by Ferguson and then Baxter. Dr. J. Ferguson is now ICI research director and Dr. Baxter is chairman of the Australian Atomic Energy Commission. Mr. S. S. Smith, in charge of the metals division work and one of the few people who associated with atomic energy work from its inception, is now the division's research manager.

★ A QUESTION frequently asked in the US is 'why so many acrylic fibres?' 'The answer is straightforward and boils down to competition', said Mr. Walter H. Hindle (associate director, Textile Research Department, the Chemstrand Corporation, Decatur, Alabama) when he addressed a joint meeting of the Manchester and District Section Textile Institute and the Manchester Section, Society of Dyers and Colourists, on the subject of 'Acrilan—its properties and uses' recently.

'It is chemically possible to manufacture a large number of acrylic fibres because of fundamental versatility, just as it is physically possible to make a large number of different automobiles', said Hindle. Chemical resistance of Acrilan to acid and solvents was of a very high order, and the resistance of Acrilan to very many other chemicals was equally good except for caustic alkalis at high temperatures. The following example was quoted by Mr. Hindle: 'In plants of the Monsanto Chemical Co., work trousers made of a blend of 50/50 Acrilan cotton had seven times the wear-life of a 100 per cent cotton.'

Initial cost of the Acrilan blend garment was two and one quarter times that of 100 per cent cotton. At one time the workers in the chemical industry would not have been inclined to pay the price differential despite the obvious economy, but today the situation was changing due to the fact that the now well-paid chemical worker in America was in a position to think more forwardly.

★ CONGRATULATIONS that Dr. Kenneth Pankhurst may have received recently on what appeared to be his impending election as the chairman of the Royal Institute of Chemistry have doubtless surprised him. They followed publication in a recent issue of CHEMICAL AGE of his nomination to this post. Unfortunately, in our paragraph, the vital words 'London section' were omitted.

To add to the confusion, since the preliminary announcement of the London section RIC annual meeting, and the names of those nominated to office was made, Dr. Pankhurst withdrew his nomination. The formal notice of the meeting, published in the October issue of the Institute's *Journal* contains the information that Dr. J. H. Pryor has been nominated to fill the vacant office of vice-chairman.

★ To attract labour to Partington, where their £25 million extension scheme is in progress, Petrochemicals Ltd. may have to consider setting up a light industry factory nearby. This step may be forced on the company because of the increasing difficulty to attract men to the plant because of the travelling involved.

Because it is the women who decided where their families will live, the company came to the conclusion that they should attract women to the area by providing them with employment. It is hoped that other firms will see the opportunity for such a factory, but if they do not then Petrochemicals may consider taking the initiative themselves.

This was stated by Mr. Walter Huggett, works manager, during a visit to the plant by local journalists last week. It was also said that the figure of £25 million was only a rough guide to the cost of developments at the site between now and 1962. The company hoped the extensions envisaged would be completed by that time, although it was not possible yet to tell what the effect of the new credit restrictions would be.

★ PYRETHRUM interests are making a bold challenge at the markets held by chemical insecticides. A new publicity campaign, based on the statement that resistance of certain important disease-carrying insects, including vectors of malaria, is growing to the synthetic insecticides like DDT, is being sponsored by the Pyrethrum Boards of Kenya and Tanganyika and the Société Co-opérative des Produits Agricoles of the Belgian Congo.

In a new pamphlet, 'Pyrethrum Facts', it is claimed that 'No case of insect resistance to PYR of any practical significance has yet been encountered, no matter how frequently PYR has been used'. The booklet tells how the post-war use of synergists has boosted the development of pyrethrum, since it has enabled manufacturers to produce insecticides based on pyrethrins at competitive prices.

It is estimated that production for the year 1956-57 will total about 5,500 tons, against 2,600 tons in 1954. Of that total the US will import about 68 per cent and the UK, the next largest importing nation, about 11 per cent.

★ BY an unanimous decision Mrs. Muriel Howorth was elected president of the Institute of Atomic Information at an 'At Home' held at the Ritz Hotel, London, on Saturday 19 October. Alembic was very pleased to see Mrs. Howorth up and about again after her serious illness which necessitated two eye operations, but was sorry to hear that she has had to give up all executive work for the Institute. The manuscript of Mrs. Howorth's book, was on show. Based on the memoirs of the late Professor Soddy, the book is entitled 'The Interpretation of Radioactivity'. Alembic looks forward to its publication.

★ 'WE are absolutely nuts in this country'. That was how Woodrow Wyatt wound up a graphic description of his visit to a research association on the BBC TV programme 'Panorama' on Monday. This succinct comment was prompted by the fact that the Government had just reduced its grant to the Production Engineering Research Association at a time when it should be spending much more on scientific research and because the association has only 520 out of a potential 10,000 members.

Interviews with Dr. D. F. Galloway and his staff showed how the association has enabled its members to save many thousands of pounds a year by greater efficiency, newer techniques and by the use of new materials.

Typical of the apathy of thousands of firms in all branches of industry was the letter read by Wyatt from a company that saw no reason to support PERA because it had 30 years of experience in its own specialised field and clearly thought that it knew all the answers. The letter added that the firm was perfectly satisfied with the product it had been producing for many years.

What is the answer to this complacency that is sapping the strength of UK industry? A clear lead from the Government by increasing expenditure on research instead of cheeseparing would be the greatest spur. More publicity would also help.

Alembic

COLOURING MATTER IN FOOD

Special APA Committee Reports

HITHERTO colouring matter in food had only been of minor importance to the analyst. This was the opening remark of Mr. F. C. Bullock, president of the Association of Public Analysts, when he addressed a meeting in London on 17 October, on the subject of 'Colouring matter in food.'

Mr. Bullock said that the Public Health (Preservatives, &c., in Food) Regulations, 1925, as amended, merely prohibited the use of dyes which were compounds of certain metals, of one vegetable colouring matter (gamboge) and of five coal-tar colours. Provided the colour used did not fall into this small class of prohibited colours the actual colour employed was of no importance to the public analyst.

The coming into force of the Colouring Matter in Food Regulations, 1957, would completely alter the position. Instead of a small class of prohibited dyes one would then have a list of thirty permitted dyes out of several thousand known dyes. It would therefore be necessary for the analyst to identify the dye used to ensure that it was in the permitted list. As public analysts are to be faced with the problem of examining large numbers of foods, many containing mixtures of dyes, the Association appointed a committee twelve months ago to devise methods for the separation and identification of colours in food. The members of this committee, stated Mr. Bullock, would now give an account of their investigations.

Classification of Dyes

Mr. F. Dixon, the chairman of the committee, paid tribute to the work of other members of the committee—Mr. R. C. Spalding for his pioneer work on the absorption spectra of the permitted dyes, Mr. P. S. Hall for his work on the chemical classification of dyes, Mr. F. C. Shenton for his comprehensive list of RF values and to Mr. R. K. Chalmers for the absorption spectra of two non-permitted dyes. The problem resolved itself into three parts, said Mr. Dixon; (1) Extraction of the colours from food (2) Separation of mixed colours (3) Identification of the individual colours.

The method of extraction of the dyes from foodstuffs would depend upon the type of food concerned but the dyes could be divided into acidic and basic, the former extracted by dilute ammonia and the latter by dilute acetic acid. The classical method of transferring the dye to wool with subsequent stripping afforded a method of separating substantive dyes from many natural colouring matters and was adopted by the committee, although certain impurities which had been shown to modify RF values were extracted from the wool.

Use of column chromatography for the separation of mixtures of dyes had been considered by the committee but the method finally adopted was that of painting a band of mixed dyes along the starting line of a paper chromatogram and developing by means of one of six solvents which they listed. By this means a good separation of the components could usually be obtained; the bands could be cut out and the individual dyes identified by chemical, chromatographic or spectrophotometric methods.

When the dye was one of those on the permitted list it was often possible to identify it by visual inspection in daylight and under ultra-violet light and by running a comparative chromatogram with specimens of the suspected dye or dyes. By choosing a pair of solvents in which the RF values of a dye differed considerably it should be possible to discriminate between similar dyes. For ease of manipulation the committee preferred separate chromatograms for the different solvents to two-dimensional chromatograms.

The separated dyes could also be identified by their absorption spectra, particularly if these were determined in acid, neutral and alkaline solution. The committee had prepared spectrograms of all the permitted dyes which would be made available to members of the Association.

Chemical classification of a dye would normally only be necessary when a dye was found which was not included in the permitted list. The committee had adopted a systematic method based upon that of Clayton (E. Clayton, *J. Soc. Dyers Col.*, 1937. **53**, 178) with several modifications, details of which were given. It was pointed out in a discussion that if non-permitted dyes were found in imported foods they would probably belong to a class of about 70 dyes which had been considered but not accepted by the Food Standards Committee which was responsible for drawing up the permitted list. In this way the vast field of known dyes which might be used illegally in foodstuffs could be reduced to more reasonable proportions.

The committee had prepared a comprehensive list of approximate RF values of the permitted dyes using six different solvents, as well as the spectrograms already mentioned. The account of the committee's work was illustrated by a large number of chromatograms prepared by different methods and by other exhibits.

Possibilities of Removing Phosphorus from Molten Pig Iron

THE British Cast Iron Research Association reports that to 30 June of this year, excess of income over expenditure was £37,559. Of this sum, £25,000 has been transferred to the buildings and equipment fund, and the balance of £12,559 has been added to the general fund.

Capital expenditure during 1956–57 amounted to £39,070. The association anticipates, however, that £100,000 will be incurred by June 1959, on cupola and ancillary equipment, alterations to the existing cupola buildings and providing a foundry atmospheres block. It is also hoped to begin construction of the first stage of the new laboratory block.

The research department of the association have been examining the possibilities of removing phosphorus from molten pig iron. A number of small-scale experiments has been carried out on the top blowing composition and gas velocity on the loss of carbon and phosphorus from the molten pig iron. Large-scale trials are in hand in co-operation with the inventors of the Kaldo top blowing process. Many small-scale siliconisation and recarburisation trials have been carried out in a small rotary furnace and large-scale siliconisation trials using lime, alumina and silica slags.

Arsenic was shown to have a beneficial effect on the formation of spherulitic graphite in nodular cast irons, and arsenic and phosphorus have been shown to improve high temperature properties. Research has also been directed at the controlling of the soundness of iron castings, and an attempt is being made to relate the degree of nucleation of the melt to the solidification sequence and the resulting soundness of iron castings.

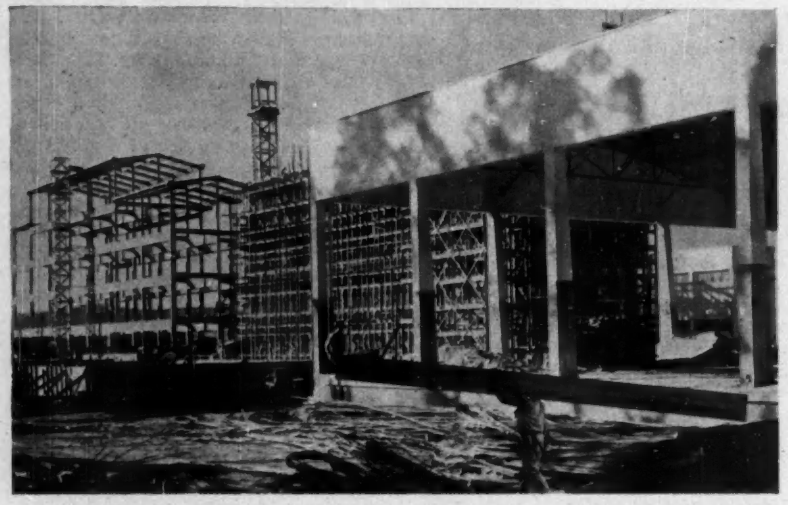
Work has been done on the degree of nucleation of the melt by eutectic cell counting and techniques have been developed and applied to the process of inoculation and in determining the effects of superheating, titanium and hydrogen. A furnace is being built for quenching and cooling curve experiments, which will assess the degree of solidification at the time of quenching.

New analytical methods for cast iron are being investigated with special attention to the chemical analysis of slags and similar material. A spectrographic method has been developed for producing standard slags by means of a continuously recording thermal balance. The analysis of used ethylene glycol anti-freeze solution is also being studied.

Gas Industry Production

Between April and June production of gas fell 3 per cent below the equivalent 1956 figure. Coal gas manufacture was reduced by 5 per cent, but water gas was 8 per cent higher. Oil gas production increased from just under 1 million therms to more than 1.8 million therms.

Coke production fell by 6 per cent below the April–June 1956 figure, and although sales were 1 per cent greater, stocks continued to rise. Crude tar production fell by 6 per cent and the output of crude benzole was almost 14 per cent lower than that of a year ago.



JOINT GERMAN / US PLANT NEARS COMPLETION IN BRAZIL

NOW nearing completion in Suzano, between Rio and Sao Paulo in Brazil, is the mammoth new plant of Fongra Produtos Quimicos SA. This company is in fact jointly owned by Farbwerke Hoechst AG, of Frankfurt, and W. R. Grace and Co., of New York, US.

Plant installations and equipment will be among the most up-to-date in the world. As far as possible machinery and equipment manufactured in Brazil is being used. However, it has been necessary to import much of the highly complex and special equipment required from Germany and the US.

Flexibility of production is the keynote of the Fongra chemical plant to allow for increased output of any given product in accordance with the requirements of Brazilian economy.

The Fongra plant will be completely self-contained. It will generate its own electricity, and steam will be produced in an oil-fired plant. Raw materials in the main will be national ones. Particular attention is being paid to the comfort and well-being of workers at the plant. For technicians who have to be available day and night, houses are being constructed at the plant site.

Manufacturing processes that will be employed will be those of Farbwerke Hoechst, with the exception of those used to produce DDT. Geigy, of Basle, will advise on the production of this last product which for the first time will be manufactured on a large scale in South America. Construction and running of the Fongra plant has been supervised by chemists and engineers from Farbwerke Hoechst.

During the first stages of production, Fongra plans to produce up to 2,000 tons of DDT a year. As demand rises, production will be increased. The electrolytic process which produces caustic soda will provide the chlorine used in the manufacture of DDT. Initially, total yearly caustic soda production will be over 3,000 tons. Three other chemicals, monochlorobenzene, which is an intermediate in the manufacture of DDT—together with paradichlorobenzene and orthodichlorobenzene —which are by-products—will also be available in sufficient quantities to meet the Brazilian market demand. As operations progress, Fongra will produce liquid chlorine, butanol, acetic acid, ethyl acetate, butyl acetate and detergents based on Fongra-produced fatty alcohols, mainly for the textile and leather industries.

New Fuel Research Station Planned

THE DSIR Fuel Research Station at Greenwich is to be replaced by a new building at Stevenage. As well as fuel research, work is to be conducted on problems of mineral processing research. The increasing demand for metals together with a diminishing supply of rich ores, and the need to examine new methods for the treatment of low grade complex ores has made this necessary. Another field of research that the new station is interested in is the use of less common metals for such developments as atomic energy and the jet engine.

This new station has been designed for a non-industrial staff of about 220 and an industrial staff of 120, and the cost is estimated at £750,000. A main service and research laboratory block is to be built, with a separate wing for administrative offices and a library. Two buildings will provide accommodation for the intermediate scale work on the synthesis of oil and for similar work on mineral processing and other projects. Provision is being made for further buildings. Work on the site has already begun and it is hoped to start occupation in the autumn of 1958 and to complete the station in the spring of 1959.

Research to be carried out at Stevenage will be in the main on the study of the synthesis of carbon monoxide and hydrogen to produce oils and chemicals, and work on the prevention of atmospheric pollution. It is planned to carry out a full scientific service on pollution for the Ministry of Housing and Local Government to assist them in making the administration decisions necessary under the Clean Air Act regulations.

Plastics Sales Increase by 19 per cent

SALES of plastics materials in the first half of 1957 amounted to 196,000 tons, nearly 19 per cent (31,000 tons) higher than in the first six months of 1956. This represented a sharp recovery in the rate of increase which had slowed down in the early months of 1956.

Exports were 8,000 tons higher than a year earlier (52,500 tons compared with 44,500 tons) and accounted for 27 per cent of total sales. Increased imports plus higher sales of home-produced plastics materials resulted in additional consumption of something like 25,000 tons by the home market compared with a year earlier.

The rise in total sales of plastics materials continued to be largely the result of increased sales of thermoplastic materials which were almost a third higher than in the first half of 1956. The most marked increases occurred in sales of polythene (over 40 per cent), polystyrene and vinyl chlorides (in particular, plasticised sheet).

Total sales of thermosetting materials were 5 per cent greater than in the first half of 1956. The improvement was shared by all types of materials in this group with the exception of casein which fell by over 30 per cent. Sales of polyesters and epoxide resins, although only a small proportion of the total, continued to increase at a much higher rate than other thermosetting materials.

The figures have been compiled from returns from over 150 firms known to have been manufacturing plastics materials, whether for sale or for use in the production of plastic goods or other goods containing plastics materials. Paint manufacturers who make plastics materials, e.g. alkyd resins, for incorporation in their finished products, are included. Firms making cables who manufacture plastics materials from purchased resins are excluded. Synthetic materials for use as textiles are also excluded.

Dangerous Chemicals Handbook for London Firemen

The Fire Brigade Committee of the London County Council has authorised the preparation of a durable pocket-size handbook which lists dangerous and potentially dangerous chemicals and the industries in which they are used, together with appropriate extinguishing and protective action.

Copies will be issued to London firemen and some will be available for sale.

Competition in Copper Sulphate Markets Described as 'Severe'

REFERENCE was made to the difficult situation existing today in copper sulphate markets by Mr. J. D. McKenzie, chairman of the British Sulphate of Copper Association Ltd., at the thirty-third annual general meeting. He said that the position was as difficult as it was in 1924, for production was still greater than the demand, and competition was as severe. He therefore considered that the Association was as necessary now as it was thirty-three years ago.

It was his firm belief that the formation of the Association saved the UK sulphate of copper industry in 1924, and that its continued existence during the last 33 years had strengthened the position of the UK in world export markets. It had also benefited the home market by ensuring that adequate supplies of sulphate of copper were available there.

Referring to the year under review, the chairman said that while the heavy fall in the price of copper created difficulties on the manufacturing side, the sales side was helped by the lowered price of sulphate of copper. In times of high prices the use of sulphate of copper tended to become less and the lower prices now prevailing should gradually have a favourable effect on consumption.

Heavier Competition

It was stressed that during the past season the Association experienced much heavier competition and the Members were faced with increased manufacturing costs. In spite of this, the total exports showed a small advance on those of the previous year and the value amounted to about £4,000,000, of which £364,000 was for the dollar markets. Ground was lost in the dollar markets, and only about half the previous year's tonnage was shipped due to the UK price for sulphate of copper (based on LME copper) being higher than the US price (based on E and MJ copper) in falling market conditions. Sales in the home market showed an increase over the previous year.

However, the reports of bad attacks of blight on potatoes show that insufficient spraying was done in spite of a lower price for sulphate of copper. The big fall in the price of sulphate of copper should encourage growers to spray more often. It was hoped also that farmers would become more alive to the danger of liver-fluke and use sulphate of copper to destroy the snails which transmit it.

Trade in the Middle East which had been expanding, received a serious setback in Egypt at the time of the Suez crisis, but it is hoped to recover lost ground there in due course.

During the year the Association registered its agreements with the Registrar of Restrictive Trade Practices.

On the effects of the proposed European Free Trade Area on sulphate of copper, the chairman said they had been seriously considered by the Association. It was thought that whereas it might help sulphate of copper exports by effecting a reduction in duty in certain countries, there was a risk that this aspect might be completely altered eventually by the export of scrap. Clearly, if scrap were allowed to leave the country in substantial quantities, then the raw material supplies for sulphate of copper would diminish and the industry, which has a big export value to the country, would be seriously affected. Also, it might make it difficult to meet home requirements of sulphate of copper for agricultural purposes. These views had been stressed to the Board of Trade.

Present prospects were rather uncertain, it was reported, due to the large carry forward of stocks from last year. Also there was further damage to vines in the past year which may result in a reduction in consumption. General restrictions on imports by certain countries make it increasingly difficult to export. About 90 per cent of the trade was for export and it could only be retained so long as prices were competitive. Any further increases in manufacturing costs due to wages, fuel, transport, etc., would seriously affect the Association's competitive position in the world markets.

Sealing Radioisotope Capsules

A new welding unit for sealing highly radioactive materials in stainless steel capsules was recently placed into operation at the Oak Ridge National Laboratory, Tennessee. The unit is remotely operated and uses an inert gas shielded arc welding torch. In the initial production run at the laboratory, which Union Carbide Nuclear Co. operates for the US Atomic Energy Commission, 34 sources containing a total of 8,000 curies of radioactive cobalt were sealed using this equipment.

The technique was developed in response to requests for radioactive sources to be used in high-temperature operations or in corrosive solutions.

Chemical Inspectorate's New and Amended Specifications

The Chemical Inspectorate, Ministry of Supply, have issued the undermentioned New and Amended Specifications during the month of September 1957. The following remarks should be noted:—

Specification No.	Index Group	Nomenclature	Action		Remarks
TS274	E2	Boron, amorphous	New		For use in pyrotechnic gasless delay compositions
TS275	E2	Bismuth oxide	New		For use in pyrotechnic gasless delay compositions
TS276	E2	Chromic oxide	New		For use in pyrotechnic gasless delay compositions
CS2763	E2	Dye, orange smoke A	New		Dyestuff for use in coloured smoke compositions. Co-ordinated K1439
CS2764	E2	Dye, red smoke A	New		Dyestuff for use in coloured smoke compositions
CS2989	EI	Comp. SR371A	New		An igniter composition
CS3003	EI	Comp. SR867	New		Pyrotechnic mixture for use as a dark ignition priming for SAA tracer
CS3019	J	Vulcanised synthetic rubber, chloroprene type	New		Chloroprene type vulcanised rubber where compatibility with double-based propellents is required. General properties of the rubber resemble those of compound C5 of BS2752:1956
CS3020	J	Vulcanised rubber strip for snow ploughs	New		Vulcanised natural rubber having good abrasion resistance, and suitable for the manufacture of squeegee strips for snow ploughs
			Amended from	to	
CS1139C	C	CNK (formerly CAPK)	B	C	Correction of out-of-date references and editorial changes. Co-ordinated K1267B
CS1335B	EI	Composition SR368	A	B	Correction of sieve size
CS2338A	A	Composition RD1064 lead free	—	A	References to IP methods brought up to date
CS2672B	A	Composition RD1074	A	B	References to IP methods brought up to date. Co-ordinated K1394B
CS2808B	J	Rubber expanded	A	B	References to recently-published parts of BS903 inserted

The following specifications are withdrawn:—

Specification No.	Index Group	Nomenclature	Remarks
TS188	G	Varnish, special	Superseded by DEF-32
TS191C	G	Varnish, special, with fungicide	Superseded by DEF-32
CS569F	EI	Fumyl, mark III	No further service use
CS937	EI	Mixture, explosive and smoke, No. 5	No further service use
CS1116A	L	Oil, low cold test no. 1	Replaced by oil OM-13 (DEF-2001)
CS1180	EI	TNT/ammonium chloride, 95/5	No further service use
CS1181	EI	CE/ammonium chloride, 95/5	No further service use
CS1189	EI	Fumyl, mark I	No further service use
CS1202	EI	Mixture, explosive and smoke, no. 7	No further service use
CS1370C	B	Silica gel	Silica gel for general packaging purposes now purchased to BS2540. The special purposes for which this material of closely specified size was required have now ceased to exist. Co-ordinated K934C
CS1380	EI	Composition SR no. 264D	No further service use
CS2264	C	Magnesium carbonate (special) partially dehydrated	No further service use

NEW US PROCESS FOR MAKING TITANIUM FROM OXIDE

US PATENT 2803536, gives details of an aluminium reduction process which reduces titanium dioxide to titanium. The process was developed by Lucio F. Mondolfo of the Illinois Institute of Technology with support from the US Navy's Bureau of Ordnance. Titanium with extremely low oxygen content is produced. It is also believed that the process may be applied to making zirconium, chromium, hafnium, niobium and vanadium directly from their oxides.

To date only laboratory scale experiments have been carried out. According to the patent a mixture of powdered aluminium and titania is added to molten aluminium (a large excess is used of 4 to 1 aluminium to make about a 30 to 70 alloy of titanium in aluminium, plus alumina). This combination reacts above 2,000° F. to give the titanium-aluminium alloy and alumina, the greater part of which can be skimmed from the bath. Molten or solid magnesium is then added to the alloy (magnesium and zinc or zinc alone can be used also). The aluminium dissolves in the magnesium, leaving molten titanium with some magnesium dissolved in it. Vacuum distillation removes the magnesium at a maximum temperature above about 1,400° F. It is stated that the distillation is a matter of temperature versus pressure.

The titanium produced is described as similar to sand in appearance. It contains some 5 to 7 per cent aluminium. Oxygen content of the titanium has been as low as 0.03 per cent and the inventor believes this could be reduced still further. Very low quantities of nitrogen and hydrogen occur.

Commercially, it is considered that this new method could compete with the Kroll process. Pigment grade titania (99.9 per cent) is suggested. It is recommended that no raw material containing heavy metals should be employed.

The value of the process appears to be that only air need be excluded from the vacuum distillation, while a simple flux cover should be provided for the molten magnesium to prevent fires. Also, magnesium can be distilled from the aluminium magnesium alloy and the aluminium recycled. There is the further possibility that the alumina recovered could be used elsewhere.

Mondolfo has carried out some investigations into the value of this process for chromium and vanadium oxide. Results obtained indicate that the chromium produced is ductile. Because of their properties, it is probable that the process can be used for zirconium, hafnium and niobium.

West German Chemists Hear Paper on New Source of Cerium

IN a paper on 'Technical developments in the field of rare earths', read to Frankfurt branch of Society of German Chemists, H. Stamm, Essen, said that beside monazite sand, bastnasite had of late attained importance as a basic material for the production of cerium products. It was found in the Belgian Congo as well as in California and New Mexico. Bastnasite is a rare-earth fluoride-carbonate which is free of thorium but usually contains alkaline earth and $F2_2O_3$, Al_2O and SiO_2 impurities.

According to W. Brugger and H. Stamm (DBP. 891 251—Th.Goldschmidt AG—30 August 1950), a fused cerium chloride free of water and oxychloride can be produced from finely-ground calcined bastnasite and carbon powder by passing chlorine over at 1,000–1,200°C., and this can be used direct for electrolytie smelting; of the secondary constituents of the basic material, the alkaline earths and part of the fluorine enter the chloride melt—they do not interfere with the electrolysis—while all other elements leave the reaction zone together with the waste gases as volatile chlorides. To apply the process continuously on a technical scale, use has been made of an electrically-heated shaft furnace designed by W. Brugger (DBP. 956 993—Th.Goldschmidt AG—6 March 1954); all parts of this furnace which come into contact with chlorine at the high reaction temperature are made of graphite.

Stamm reported that this furnace was suitable also for other chlorination processes at extremely high temperatures, e.g. for the reduction of monazite or manganese ore (cf. H. Stamm and W. Brugger, DBP. 847 886—Th.Goldschmidt AG—24 August 1950).

From the cerium chloride obtained a remarkably pure cerium-iron alloy can be produced by electrolysis in graphite cells. Its principal use is still in the production of pyrophoric alloys. Until recently it was impossible to make flints for cigarette lighters, etc., from cerium-iron alloys by other means than casting. W. Bungardt has found conditions under which such alloys can be shaped by extrusion without any loss of sparking power (DBP. 891 824—Th.Goldschmidt AG—2 October 1948).

The fact that the rare earths have become cheaper in recent years as a result of increase of production capacity and improvements in reduction and separation methods is suggested by Stamm as a strong incentive for developing new uses for these materials which are no longer rare at all.

Obituary

PROFESSOR J. A. S. RITSON, Emeritus Professor of Mining in the University of London, died on 16 October, aged 70. Professor Ritson was one of HM Inspectors of Mines. In 1923 he took the Chair of of Mining in Leeds University. He was made O.B.E. in 1935 and the next year was appointed to the Chair of Mining in the Royal School of Mines, Imperial College.

New Melting, Emulsifying and Cleaning Agents

NEW COMPOUNDS and their salts which are stated to be excellent melting, emulsifying, cleaning and disinfecting agents, and yet non-irritating to the human skin, even in high concentrations, are indicated in a German Patent application, 1,004,194.

Tertiary amines of the general formula $RR'N.CH_2.CH(OH).CH_2OH$ are described in which R is an aliphatic hydrocarbon radical with six to 16 carbon atoms, R′ is an aliphatic hydrocarbon radical with one to five carbon atoms, a hydroxalkyl or dihydroxalkyl group with two to four carbon atoms, or an aryl or aralkyl group. These amines can be prepared by treating RNH_2 or RNHR′, with glycide or with a glycerol-alpha-mono-halogenohydrin. Examples are N. methyl-N-($\beta\gamma$-dihydroxypropyl)-dodecylamine, N-(β-hydroxyethyl)-N-($\beta\gamma$-dihydroxypropyl-dodecylamine and N:N-bis hydroxyethyl)-N-($\beta\gamma$-dihydroxy propyl)-dodecylamine.

These long-chain tertiary amines are also stated to act as solubilising agents for water-insoluble antibacterial substances.

Alkyl Levulinyl Glycollates as Plasticisers

EXPERIMENTS are reported by Heinosuke Yasuda (J. Scien. Res. Instit. 1957, **57**, 86) indicating that alkyl monochloroacetates, condense with potassium or sodium levulinate in boiling alcohols as a solvent, to give the required levulinic esters, which have not hitherto been described.

Synthesis of these alkyl levulinyl glycollates was accomplished by heating 0.1 mol of potassium or sodium levulinate and 0.1 mol of the alkyl monochloroacetate in 50 ml. of the corresponding alcohol at reflux temperature for three hours, after which separated potassium or sodium chloride was removed. The alcohol was recovered from the filtrate, and the residual oil was subjected to fractional distillation under reduced pressure.

The products obtained are slightly yellow liquids of faintly pleasant odour. They are markedly soluble in regular solvents and insoluble in water except for the methyl and ethyl levulinyl glycollates. As definite boiling points are not given by these esters, each ester is characterised by the corresponding semicarbazone or 2,4-dinitrophenylhydrazone.

The preparation of levulinyl glycollic esters was attempted for effectual utilisation of levulinic acid produced as a by-product in manufacturing glutamic acid. The esters are expected to prove useful as plasticisers.

Oil and Colour Exhibition

Stands have now been allocated for exhibitors to the 1958 Technical Exhibition of the Oil and Colour Chemists Association, which will take place in the Royal Horticultural Society's New Hall, London SW1, on 11, 12 and 13 March. As in previous years, the theme of the exhibition will be the presentation of technical advances in those trades supplying the paint, varnish, printing ink, linoleum and other allied industries. Further information from OCCA Memorial Hall, Farringdon Street, EC4.

CORROSION CONVENTION AND EXHIBITION IN LONDON

72 Stands Show Range of Products

OPENING the Corrosion Exhibition at the Royal Horticultural Society's Old Hall on 15 October, Mr. Harmar Nicholls, Parliamentary Secretary to the Ministry of Works, said that he believed that this was the first occasion on which an exhibition had been staged to inform the public of the effects of corrosion and of the methods available for its control. The fight against decay had a long history; and as long as metals had served man, man had sought ways and means of preserving his cherished possessions against the effects of age, climate and chemical action. Mr. Nicholls stressed that the country did not want to waste valuable manpower in unnecessary replacement. Where in the past corrosion might have caused merely a temporary inconvenience, today it meant risk of serious accidents and disastrous losses. Several of the Government's own research stations and the Research Associations had been increasingly exercised in these efforts, as have similar agencies overseas. They and the Society of Chemical Industry with its special Corrosion Group had done much to pass on the results of these efforts to the technical people best able to develop and apply them.

Cost of Replacements

Annual world cost of immediate replacements due to corrosion probably amounted to some thousands of millions of pounds, stated Mr. Nicholls. Indeed in 1956 Dr. Vernon (formerly head of the Corrosion of Metals Group, Chemical Research Laboratory) estimated that corrosion costs the UK some £600 million each year. This estimate includes the cost of preventive measures as well as the cost of metal losses. If this could be reduced appreciably, then many imports would be saved and industrial costs lowered. Sterling work had already been done in this fight against decay. He hoped, however, that all would go away from the exhibition with the firm resolve to use every method in their power to combat the shocking depredations of corrosion on the country's material wealth.

The exhibition, which was organised by the Leonard Hill Technical Group, ran for three days and included exhibits from 72 companies and research organisations. A corrosion convention was held at the same time as the exhibition.

Among the exhibits shown by *The Amber Chemical Co. Ltd.*, were fuel additives including Amber SSR 113 powder for the treatment of heavy residual fuel oils for the reduction of sulphur corrosion and air pollution. (See CHEMICAL AGE, 19 October, p. 644.) Other exhibits by this company were products for boiler feedwater treatment and for central heating and hot water systems, together with rust protection products, anti-corrosive soluble oils for machining and a range of anti-corrosion aerosol products.

The stand of *BX Plastics Ltd.*, Higham Station Avenue, London E4, featured a display of chemical plant fabricated mainly from Cobex rigid vinyl sheet. Equipment made by eight companies was on show, including pickling baskets, tanks, ducts and trunking, buckets, rumblers, trays, racks and grills.

Rigid plastics corrosion resistant piping made from Chemidus 2000, an unplasticised p.v.c., was shown by *Chemidus Plastics Ltd.*, Dominion Buildings, South Place, London EC2. Examples were shown of pipe in various wall thicknesses and in diameters up to 12 in., and solid and hollow round bar up to 4 in. in diameter. A range of specially developed tubing for fume extraction work was also shown, together with pipe made from a rubber-modified high impact p.v.c (Chemidus HI 20) which is shock resistant.

Acid-proof Linings

The design and construction of acid-proof plant and vessel linings, floorings and protective coatings is carried out by *Corrosion Proof Products Ltd.*, Sunleys Island, Great West Road, Brentford, Middlesex. On show on their stand was a miniature tank lined to a typical modern specification for highly corrosive conditions. Samples were on show of their principal ranges of chemical-resistant cements and membranes including furane resin cement, cashew nut shell resin cement, plasticised sulphur cement and many others.

Protection of concrete and related products was the feature of the stand of *England, Hughes, Bell and Co. Ltd.*, Valley Works, Monton Road, Eccles, Manchester. The application of Ceramite, an Epikote-based finish, to concrete, cement and similar porous alkaline building materials as well as metals was demonstrated.

On display for the first time on the stand of *Evode Ltd.*, 1 Victoria Street, London SW1, was Bitugell, a heavy-duty anti-corrosive based on asphaltic bitumen. Bitugell is claimed to provide in one gelled coat a film thickness five times thicker than a conventional three-coat system. It contains a corrosion inhibitor and is stated to be unaffected by dilute acids and alkalis. It can be applied to moist surfaces.

Several other Evode anti-corrosive paints were also on show, including Evodyne chlorinated rubber paint, Evokote anti-bituminous paint and the Evokote range of Epikote resin-based paints.

The metals division of *Imperial Chemical Industries Ltd.*, PO Box 216, Birmingham 6, showed the application of non-ferrous metals where resistance to corrosion was necessary. Special alloys of copper and aluminium have been developed to produce corrosion-resistant films. The corrosion-resistant properties of titanium were exhibited and attention was drawn to the special properties which, it is claimed, make it particularly suitable for chemical and other process plant.

Three grades of Durapipe corrosion-resistant tubing were shown by *H. Incledon and Co. Ltd.*, Winnock Works, Winnock Road, West Drayton, Middlesex. Durapipe Z is a Ziegler high density polythene which is claimed to have all the chemical properties of soft polythene but to be mechanically much stronger and to have better heat resistance. Durapipe K is a rubber resin and Durapipe N is nylon and is produced for higher temperatures up to 100°C. A special heat-stabilised grade is said to be suitable for temperatures up to 150°C. A full range of fittings to go with these pipes is available.

A range of corrosion-resistant materials was shown by *Kestner Evaporator and Engineering Co. Ltd.*, 5 Grosvenor Gardens, London SW1. Pipelines and valves were shown as well as tanks, pumps and stirrers. Also shown was a small unit with pump and stirrer operating to and from a corrosion-resisting tank through a range of corrosion-resisting pipes.

A combined p.v.c.-polythene valve was shown by *KW Chemicals Ltd.*, 41 Kingsway, London WC2. The body of the valve is moulded in polythene which is resilient and the working parts are made from the more rigid p.v.c. Made in four sizes, it is claimed to be ideally suitable for lines carrying corrosive liquids.

P.v.c.-lined fans and fans made entirely from p.v.c. were also on show together with a range of polythene fittings. The company also make fume extraction ducting, lip extractors, hoods, fume cupboards and scrubbing towers made from p.v.c., polythene and HT polythene.

The stand of *Shell Chemical Co.*, 15-17 Great Marlborough Street, London W1, showed the uses of Epikote resins in surface-coatings and other corrosion-resistant applications. Ziegler polythene, made by Petrochemicals Ltd., a Shell company, was also shown, together with Carina, the Shell brand of p.v.c.

Another exhibit was Shell VPI 260 (powder) which is used to combat corrosion in packaging. It may be applied as a powder, as solution, as a coating or wrapping material or in conjunction with a cocoon or other type of plastics envelope.

Stainless Steel is Subject of Two New Films

Two new films, 'Where the Staybrite Steels are Made' and 'The Manipulation of Corrosion- and Heat-resisting Steels' were given a pre-view on 15 October. Made by Firth-Vickers Stainless Steels Ltd., the first film takes the audience for a tour of the company's Sheffield works. The second gives advice on the handling of special steels and shows examples of correct and incorrect handling.

Corn Syrup Analysis by Selective Adsorption

QUICKER and more accurate determinations of dextrose, maltose, and dextrin fractions are stated to be possible using a new procedure for the analysis of corn syrup, recently developed by Emma J. McDonald and Roger E. Perry, Jun., of the US National Bureau of Standards organic chemistry laboratory. Use is made of the selective properties of certain carbon adsorbents; after the mixed syrup has been adsorbed on a suitable carbon column the several sugars can be removed selectively by three successive washings under pressure with water, 5 per cent ethyl alcohol, and 15 per cent ethyl alcohol. Following this rapid separation of individual sugars each may be determined quantitatively by well-known methods.

The apparatus required for the new separation method is quite simple. A glass column is filled with equal weights of the carbon adsorbent (Darco 60, analytical grade) and a diatomaceous earth filler (Celite). The top of the tube is coupled to a nitrogen tank, so that 30 to 50 pounds pressure can be applied to increase the rate of flow of liquid through the adsorbent. The sample to be analysed is added and allowed to penetrate the column. One litre of water is then passed through under pressure. The water removes the dextrose, but none of the maltose or dextrins. The washing is repeated, using this time a litre of 5 per cent ethyl alcohol; this removes the maltose, leaving the dextrins. The dextrins are then removed with a litre of 15 per cent ethyl alcohol. Finally, on completion of the run, the column is cleaned with 95 per cent alcohol and then washed with water; this removes all traces of carbohydrates and leaves the apparatus ready for the next run. The whole separation can be accomplished in about 1½ hours.

Each of the three washings is evaporated under diminished pressure to a volume that can be made up to 100 ml. The dextrose and maltose fractions are analysed quantitatively either by polarisation or by one of the accepted chemical procedures, such as Munson and Walker's reducing sugar method. The dextrin fraction, consisting of a mixture of polydextrose molecules, is reported in terms of its dextrose equivalent.

Reproducibility of the order of 1 per cent for dextrose and maltose determinations is claimed to be attainable with the new method. Most of the small uncertainty is the result of incomplete and slightly inconstant recovery from the carbon column. Recovery averages about 97 per cent, experiments indicate, and varies with the particular column used. However, the incomplete recovery can be largely compensated for by experimentally establishing a correction factor for the particular installation. Once the sugars have been separated, accuracy of the order of 0.3 per cent is attainable by chemical methods. Polarimetry tends to give somewhat less accurate results.

If the alcohol concentration of the washing solution is increased in several steps between 5 per cent and 30 per cent, the dextrins can be divided into triose, tetrose, and higher polysaccharides. For most analytical purposes where time is important, however, it seems quite adequate to use the three-solution procedure and leave all the dextrins grouped together. Studies are continuing to extend the new method to include sucrose and invert sugar in syrups.

High Temperatures Produced by New Water-Stabilised Electric Arc

A NEW and potentially valuable research device, the water-stabilised electric arc, has been developed in the US, and is said to have produced temperatures as high as 25,600°F.

Although the temperature of the jet has been exceeded in atomic explosions, it is the highest yet available for use in laboratory studies. The stabilised arc is capable of safe operation for extended periods of time and has already been operated continuously for three minutes.

Chicago Midway Laboratories, a scientific division of the University of Chicago, developed the improved water-stabilised arc under subcontract with the General Electric Company's missile and ordnance systems department (Philadelphia). It was developed to study the behaviour of materials under extremely high temperatures. Although the primary object was to investigate the behaviour of hypersonic missiles, it is stated that many new basic research studies in chemistry and physics can now be undertaken.

The heat of the device is derived from electricity crossing the gap between two graphite electrodes, the lower one of which is shaped like a rod and the upper one like a ring. The temperature, which is determined by a spectrograph, is intensified by a spinning cylinder of water that surrounds the arc. This wall of water confines the arc and concentrates its energy. Some of the water vaporises, feeding molecules of oxygen and hydrogen to the stream of atomic vapour 'plasma' that is forced through the opening in the upper electrode. It is this super-heated jet of plasma into which metals and other materials are plunged for testing.

It is planned to replace the water with liquid air, nitrogen, and helium to simulate conditions that would be encountered at different levels of the atmosphere.

The power used in producing a temperature of 25,660°F is 8,000 kW. Greater concentration of this power can produce temperatures near 50,000°F.

Polythene Oxidative Degradation

RESULTS of degradation experiments on polythene in molecular oxygen between 150°C and 250°C, in ozone-enriched oxygen between 20°C and 109°C, and in fuming nitric acid between 25°C and 83°C are described in a report by H. C. Beachell and S. P. Nemphos, University of Delaware, for the US Air Force. (Order PB. 121682, from the Office of Technical Services, US Dept. of Commerce, Washington 25, price 75 cents).

Solid, liquid, and vapour products were analysed through their infra-red spectra. The kinetics of oxidation were determined by measurement of oxygen absorption at both constant pressure and constant volume and by the spectroscopic increase in carbonyl-band absorption. Absorption of oxygen appeared to be second order with an activation energy of 8-9 k cal/mole for the volumetric and manometric studies as well as for the ozone-catalysed reaction, the report states.

The Elenich equation for chemisorption was applied successfully to the kinetic data. This reaction appeared to be a typical free radical one with a hydroperoxide intermediate. Oxidation with ozone was found to be comparable to that with oxygen, and ozone affected only the initiation reaction. Oxidation with nitric acid with an activation energy of 35.6 k cal/mole, proceeded by a different mechanism.

Three Per Cent Increase in Chemical Price Index

THE PRICE index of chemical and allied products for September 1957 was 144.1, compared with 139.6 for September 1956 (30 June 1949 = 100), an increase of 3.2 per cent. More detailed figures are as follows:

Product	September 1956	September 1957
Dyes	144.0	143.2
Disinfectants	126.5	126.5
Insecticides, weedkillers and fungicides	138.3	131.7
Synthetic resins and plastics materials	123.5	121.2
Benzole, pure BSS	182.9	191.4
Caustic soda liquor, 100° Tw.	157.6	168.6
Soda ash, light (delivered)	164.5	174.5
Soda ash, light, f.o.r. works	173 4	185.7
Sulphuric acid, BOV	173.7	177.2
Sulphuric acid, ROV 94/95 per cent	181.8	190.8
Drugs and pharmaceutical preparations	102.7	105.6
Synthetic detergents	115.4	121.1

UK AEA exhibition of Dounreay Research Work

RESEARCH work carried out in the laboratories at Dounreay will be on show at an exhibition opening at 10 Carlton House Terrace, London SW1, on 5 November and continuing for three days.

The reactor now under construction, due to come into operation early next year, is experimental and the steps that will be taken to obtain information from it will be outlined. Stages in the development of the fuel elements, the metallurgy and fabrication of the fuel and canning and post-irradiation research will be demonstrated, as well as methods of re-processing spent fuel to eliminate fission products and recover unused fuel and plutonium.

Overseas News

RARE EARTH SEPARATION BY LIQUID ION EXCHANGE

ABOUT to undergo trials at Horizons Inc. US is a rare earth separation process which is believed to combine high capacity of solvent extraction with high efficiency of ion exchange. It is described by R. C. Vickery, head of Horizons' chemistry section, as a liquid ion exchange process using 2-diethylhexyl phosphoric acid (0.1 molar) in a petroleum ether carrier. Rare earths move rapidly into the petroleum ether from which they are extracted with ammonium citrate. By regulation of the pH of the extractant, and its weight ratio to the petroleum ether layer, preferential extraction of individual rare earths is possible. These are then precipitated as oxalates and fired to oxides.

Ninety-seven per cent recovery (as oxides) of individual rare earths at 99.5 per cent purity is claimed. More ready separation is claimed using this method for mixed chlorides of gadolinium, europium, and samarium than employing sodium amalgam reduction. Samarium and europium are stated to be obtained in almost 99.9 per cent purity; gadolinium contains about 0.2 per cent samarium. Using the method for a 50–50 mixture of yttrium and erbium chlorides, 99 per cent recovery is obtained for the former and 98 per cent for the latter. Purity of both is better than 99 per cent.

A disadvantage of the method is the use of petroleum ether which requires a closed system. Other less inflammable carriers have been tried but have proved less successful.

Bench-scale experiments employing 200c.c. columns set up in series are planned which should run continuously for about 14 days. It is estimated that 900 grammes a day of mixed rare earth chlorides will be separated.

Vickery suggests that the process will be economic, will give competitive products and may well find application in monazite-treating plants.

South African Uranium Exports Rise

Value of exports of prescribed materials —uranium and thorium—under the Atomic Energy Act, for September, according to a preliminary estimate by the South African Department of Excise and Customs, is put at £3,498,325, making the cumulative total for the year to date £35,109,015. The figures for the previous year were £2,750,932 and £27,825,026 respectively.

Meat and Wine Research in Australia

Australia is to establish a national meat research centre, sponsored by Sydney University and Australia's Commonwealth Scientific and Industrial Research Organisation. So far, nearly £A10,000 of the £A90,000 needed has been donated. The university is to contribute an animal husbandry farm of 400 acres near Sydney, together with the services of two members of its staff, and the CSIRO will give the services of a research team of four scientists, together with technical staff and funds for their maintenance.

A new £A74,000 building for the Australian Wine Research Institute is also under construction. Placed in the grounds of the Waite Research Institute, Adelaide, the new building includes offices and laboratories and a pilot winery where scientists can develop their laboratory discoveries on a semi-commercial scale. Staff are expected to move in later this year.

New Petrochemical Plant for Canadian Company

A new $25 million plant for Carbide Chemicals Company Ltd., recently opened at Montreal East, will convert petroleum refinery gas concentrates into polythene and ethylene derivatives.

Spanish Fertiliser Prices

At the last sitting of Spain's Ministry of Agriculture, fertiliser prices were raised from 12 to 16 per cent due to higher domestic costs, and the price of imported fertilisers, by increasing subsidies. The price will increase by 450 pesetas per ton for home-produced products and by 300 pesetas for imported fertilisers.

Hydrofluoric Acid Plant for Mexico

Anhydrous hydrofluoric acid is to be produced by Fluoro Mex. SA, in a plant near Mexico City. The sole client will be Pemex who use the acid as a catalyst in the production of aviation gasoline and additives.

Indian Titanium Dioxide Industry Protection

On the recommendations of the tariff commission, the Government of India has decided, it is reported, to continue protection to the titanium dioxide industry for a further period of four years to 31 December 1961. At the existing rate of protective import duty—35 per cent *ad valorem* (preferential) and 45 per cent *ad valorem* (standard).

US to Sell or Lease Cuban Nickel Plant

General Services Administration, US, have announced that the US Government is to sell or lease its nickel plant at Nicaro, Cuba, to a private concern. Interested parties will be invited to submit proposals. It is expected that National Lead will be one such party.

The Cuban plant is the second largest nickel plant in the free world in which the US Government has invested $85 million (£28 million approximately). It is operated for GSA by the Nickel Processing Corporation in which a 74 per cent interest is held by National Lead. Nickel Processing Corporation's contract expired at the end of June but was extended for a further six months pending a decision on the future of the plant.

Capacity of the plant was increased in March this year from 30 million lb. of metal a year to 50 million lb. From May, when the US Government stopped taking nickel for stockpile, the Nicaro output has been sold to private industry.

Italian Agents Seek UK Fine Chemicals

Agrar, S.r.l., Societa Industriale e Commerciale, Via Terenzio, 21, Rome, wish to represent UK manufacturers of fine chemicals and pharmaceutical products, particularly producers of hormones, pure chemicals for analysis, and chemical intermediates.

Ammonium Sulphate Fertiliser Plant in Pakistan

The Pakistan Industrial Development Corporation has started preliminary field work in connection with the setting up of a fertiliser factory in East Pakistan. PIDC has signed an agreement with the Kobe Steel Works of Japan to complete the construction of the factory and to put it into commission by 1961. The proposed factory will cost about rupees 15 crores (£11,250,000) and it will produce 250,000 tons of standard fertiliser a year, made from ammonium sulphate.

Canada's Tariff Protection Requirements

Canadian chemical industry needs tariff protection if it is to realise its potential. This was stated by H. Greville Smith, president of Canadian Industries Ltd., when he addressed a meeting of the Canadian section of the Society of Chemical Industries.

'The United Kingdom and the United States both built up their chemical industries,' he said, 'only with the aid of substantial tariff protection. The Canadian chemical industry requires a similar measure of protection if it is to realise its potential in regard to recent advances in chemical technology.'

Mr. Smith said he did not think an economic policy ignoring secondary industries and emphasising export of Canada's natural resources was sound. 'It is not a case of one or the other, but a good measure of both.'

Montecatini's Commercial Scale Production of Polypropylene

Until recently Montecatini were producing polypropylene, Moplen, in pilot plant quantities at their Ferrara plant. Now, using the low pressure catalytic process, the company is currently producing enough Moplen to satisfy Italian demand for use in pipe, chemical equipment, films, and containers. Montecatini are also making polypropylene fibres on a semi-commercial scale. By 1958, the company hopes to have trial quantities available in the US.

Polythene Bag Technique for Inert Atmospheres

Two members of the polychemicals department of E.I. Du Pont de Nemours Inc., US, report a simple, yet inexpensive,

way to carry out reactions in a inert atmosphere. They use a polythene bag of the right size, and insert a hose in one end to feed in the desired gas. Reactants are fed into the open end of the bag; the end of which is then folded under several times and clamped shut. Through the hose inert gas is charged and exhausted by vacuum. This procedure is repeated five times. According to these Du Pont chemists the atmosphere in the bag is about as pure as the gas instilled. They claim that using this technique they can effect many reactions such as olefin polymerisation, preparation of amine hydrochlorides, organometallic reactions, etc. They also state that less gas is used with this technique.

Titanium Dioxide in Mexico

The Mexican company of Industrias Quimicas de Mexico SA is to build a titanium dioxide plant in the state of Vera Cruz with a capacity of 8,000 tons a year. The process, with technical assistance, is being bought from the US company of Glidden.

Australian Uranium Treatment Plant

At a site on the South Alligator River area of Australia's Northern Territory, United Uranium NL is to erect a treatment plant to produce uranium oxide. A new solvent extraction process will be used to produce the concentrate. The plant is to have a capacity of 30,000 tons of ore a year.

Dutch Catalyst Factory Being Built

Building work has begun at Koninklijke Zwavelzuurfabrieken v/h Ketjen, Amsterdam, on a fourth factory for the production of catalysts for the oil refineries of a US oil group operating outside the US. The new factory will be run in co-operation with the American Cyanamid Co. which will have a fifty per cent share in both operation and profits. A new company will be formed for this purpose. The costs of the new factory are estimated at Fls. 8m. At present the company produces 300 tons of sulphuric acid a day, of which about one-half is exported.

The company has acquired the entire share capital of NV Handels-Maatschappij Nedigepha, a sales company for the pharmaceutical products of the German Bayer group. The management of Ketjen stated that results for the first eight months of this year were satisfactory.

US Mercury Prices Fall

Due to expanded production by California, Nevada and Idaho and other western states, US mercury prices have continued to fall. Price by 12 October was $236 to $239 per 76-lb. flask (Government price $225) compared with $255 a year ago. US Interior Department estimate domestic consumption at 55,000 flasks a year and production at 30,000. Very much a present-day application for mercury is in guided missiles.

German Company in Sardinia

Wintershall AG, of Kassel, Germany, has established with the Sardinian Government, the Societa per Azione Idrocarbuic Sardigna (SAIS). The German company has the majority holding. The new company will prospect for petroleum and natural gas over an area of 9,000 square kilometres. It should be noted that the new Italian petroleum law which is not encouraging to foreign countries does not apply in Sardinia.

New Belgian Fertiliser Prices

New prices have been announced in Belgium for nitrogen fertilisers. These are (in Belgian francs per 100 kg.): Ammonium nitrate (20.5 per cent N), loose-packed 300.70 frs., in paper sacks 315 frs., in jute sacks 321 frs. Ammonium sulphate (20.5 per cent N), loosepacked 276 frs., in jute sacks 309.50 frs. Calcium cyanamide (22 per cent N), in paper sacks 445 frs., in jute sacks 456 frs. Perlamide (18 per cent N), in paper sacks 394 frs. Chile saltpetre 332 frs. (139.6 Belgian francs = £1.)

Superphosphate and Sulphuric Acid Factory for Bombay

A new company, Western India Chemical Industries, Peoples Building, Sir Phirozshah Mehta Road, Bombay, has been granted a licence under the Indian Industries (Development and Regulation) Amendment Act 1956. It has been sanctioned to make superphosphate (2,750 tons a month) and sulphuric acid (1,375 tons a month).

BP's Continental Refinery Expansion

An extra 1.5 million tons a year can now be produced by the British Petroleum Company's refineries in Antwerp and Hamburg following the completion of major modifications to the distillation units and ancillary equipment.

At the Antwerp refinery, jointly owned by BP and Petrofina, capacity has been raised from 3m. tons to 4m. tons a year. Two new units, a 400,000-ton hydrofiner for removing sulphur from gas oil and a 350,000-ton-a-year catalytic reformer for producing a high-grade motor spirit component, are to be commissioned next year at this refinery. BP's Hamburg refinery is now capable of processing 2m. tons of crude oil a year. Until recently its annual capacity was 1.5m. tons.

New Zealand's Iron-Sand Deposits

A steel plant costing £25 million is planned by a New Zealand company to work iron-sand deposits on the West coast of North Island. The deposits are estimated at 700 million tons.

By means of an electro-smelting process the company hope to convert the iron-sand into steel, titanium, vanadium and thorium.

Esso to Build Dutch Refinery

Capacity of the new oil refinery to be erected in the Botlek area of Holland will be 4.5 million tons of crude a year, a considerable part of which will be exported. The management of Esso Nederland NV, a subsidiary of the Standard Oil Co. of New Jersey, US, stated recently that the Netherlands Government and the US parent company had agreed to this figure. Construction, which will be carried out by Badger-Comprimo NV, The Hague, will begin in 1958. Production is expected to begin in 1960.

Export of Salt from Thailand

Salt exports from Thailand are increasing. The biggest customers for Thai salt, Indonesia and Japan, have ordered 220,000 tons this year, of which 180,000 tons have already been shipped. South Korea and Japan are reported to be negotiating for a further 100,000 tons.

Knapsack's Post-war Rebuilding

THE acrylonitrile plant being built by Knapsack-Griesheim AG at Knapsack, near Cologne, and referred to in CHEMICAL AGE, 5 October, p. 560, is the latest of many additions to a factory that was 80 per cent destroyed in a 1944 air-raid. The remarkable post-war rebuilding programme at the Knapsack works is detailed in a brochure produced to commemorate the 50th anniversary of the Knapsack works.

Reconstruction started in 1945, when the Libar waterworks was brought into service and one carbide furnace came into production. The following year, acetic acid and acetone facilities were again brought into service, plus two further carbide furnaces. In 1949, the granulated calcium cyanamide plant was reconstructed and a year later production of monochloracetic acid was started and production of ferro silicone restarted.

By 1951 production had been restored in all fields and towards the end of the year building started on West Germany's first phosphorus plant. A year later the company was released from allied control and shares were transferred back to Farbwerke Hoechst AG. Also in 1952, a switch was made to isopropanol in place of acetic acid as starting material for acetone.

Most of the output of the new phosphorus plant, on stream in 1953, was being burnt to phosphoric acid. The carbide division acquired new crushing, granulating and grading facilities. Production of acetylene black for dry batteries was started, as was experimental work on the production of magnesium.

The following year was marked by ferro silicon powder production by a Knapsack-devised process and the start of production of vinyl chloride.

A new completely closed carbide furnace of 40,000 kW. rating was brought into service in 1955. Last year plants were commissioned to manufacture the detergent auxiliaries sodium tripolyphosphate and tetrasodiumpyrophosphate by Knapsack process. A second 50,000 kW. phosphorus furnace also came into service in 1956, bringing Knapsack's capacity for elementary phosphorus to 35,000 tons a year.

The current year has been marked by the start of building work on the acrylonitrile unit, due on stream early 1958, and the bringing into production of a plant for chloroprene, a raw material for synthetic rubber.

CHEMICAL PIONEERS

12 Walter Weldon

Walter Weldon, the subject of this 12th article by Dr. D. W. F. Hardie, began his career as a journalist. In August 1860, there appeared the first issue of Weldon's Register of Facts and Occurrences in Literature, Science and Art. In 1865 he became interested in industrial chemistry and three years later Weldon's lime-air process was making chlorine for bleaching powder.

WALTER WELDON was born on 31 October 1832 at Loughborough, where his father was in business as a manufacturer. His education, which he probably received in his native town, was not of a scientific nature. His parents were Swedenborgians—a sect to which he himself remained deeply attached throughout his life—and adherence to this dissident creed would have excluded him from attendance at an English university.

It is not known with certainty what turned Weldon's interest, in 1865, when he was 33 years old, in the direction of industrial chemistry. In that year he made the acquaintance of a fellow Swedenborgian, C. T. Hook, a paper-maker of Snodland, near Rochester, Kent. Esparto grass, in the early 1860s, was being imported in rapidly increasing quantities into this country as a paper raw material. Paper manufacturers were becoming much concerned with the high cost of bleaching powder, their requirements of which were increasing. Hook, no doubt, discussed the matter with Weldon. Weldon threw himself into the task of acquiring a knowledge of chemical principles. It is not surprising, however, that a mind habituated to popular exposition and wholly undisciplined by experience in laboratory or chemical factory should underestimate the difficulties in applying chemistry to practical problems. In September 1865 Weldon revealed in confidence to John Spiller, two processes he had invented for industrial production of magnesium and aluminium. Neither proposal had a practical outcome, and, presumably because of Spiller's adverse opinion, Weldon refrained from applying for patents.

Weldon publicly signalised his entry into the field of industrial chemistry in 1866 with six patents, all of which were granted between March and October of that year. The first of the inventions specified concerned a process for producing soda by reaction of magnesium bicarbonate with brine; the fifth was Weldon's first version of his chlorine process. That these inventions were mere contriving on paper based on very slight knowledge of the nature of chemical reactions may be gathered from the claim made in the sixth specification that common salt was decomposed by a process which 'consists in heating the salt to the point at which steam will react with it'.

In the autumn of 1866 Weldon demonstrated to Col. Gamble, son of James Muspratt's former partner, a process for making soda by decomposition of common salt with hydrofluoric acid (the subject of one of his 1866 patents). Gamble expressed the view that the process was unlikely to find industrial application, if for no other reason than difficulty in obtaining materials capable of resisting the action of hydrofluoric acid. Weldon then drew Gamble's attention to his invention for—as he then believed—regenerating manganese dioxide in the manufacture of chlorine. Gamble's interest was aroused, but he pointed out that William Gossage had already been operating a similar process for some years and had abandoned it as unsatisfactory. Weldon's obviously high intelligence and enthusiasm, however, made their impression on the St. Helens alkali-maker and he invited him to come north to his works laboratory to continue experiments there.

Weldon's Chlorine Process

At St. Helens, Weldon, with the assistance of the works manager, E. Bramwell, soon discovered the necessary conditions for converting waste manganese chloride from the chlorine stills to manganese dioxide, instead of to the sesquioxide which Gossage had obtained. Even at this stage, a practical industrial process was not yet in prospect. In the meantime, Weldon's active mind had devised another chlorine process, using magnesia in place of lime. Pilot experiments on this second process were carried out on a considerable scale and delayed development of the original lime process. Work on the lime process was eventually resumed at St. Helens and also at Walker Alkali Works on the Tyne. By 1868 Weldon's lime-air process was making chlorine for bleaching powder at St. Helens and in the following year was working on full commercial scale.

Essentially, Weldon's chlorine process was a cycle of operations by which manganese chloride was converted to calcium manganite:

$$MnCl_2 + 2\,CaO + O(air) \rightarrow CaCl_2 + CaO.MnO_2;$$

(Calcium manganite or 'Weldon mud') and the manganese chloride regenerated by using the manganite to oxidise by-product hydrochloric acid from saltcake manufacture:

$$CaO.MnO_2 + 6\,HCl \rightarrow CaCl_2 + MnCl_2 + 3\,H_2O + Cl_2$$

It will be seen from these equations that only one-third of the chlorine in the hydrochloric acid used was liberated; this was, however, no serious drawback—hydrochloric acid was at that time a plentiful by-product of the Leblanc system. What was important was that the process resulted in largely eliminating waste of manganese, and thus decreased the current price of bleaching powder by £6 a ton. An advantage of Weldon's process over Deacon's, which was developed later, was that the chlorine was generated at 85–90 per cent strength, instead of at a maximum of only 9 per cent. Six years after Weldon's process was successfully put into large-scale operation 50,000 of the 90,000 tons of bleaching powder then being annually produced in this country were manufactured with chlorine made by its means. Twenty-two plants were then in operation and about forty others in process of erection; the process was also being extensively worked on the Continent.

His chlorine process was by no means Weldon's only chemical invention. During the 20 years following his entry into industrial chemistry Weldon filed no fewer than 35 patents relating to most of the technical problems which heavy chemical manufacturers in the Leblanc industry were attempting to solve. In 1876 Weldon filed 12 patents in one day; these were mainly concerned with various processes for producing sodium sulphide, or for utilising it in the manufacture of alkali. Although, in 1875, Weldon said of Solvay's ammonia-soda process, then recently introduced into this country by Ludwig Mond, that 'the process is so slow, and the apparatus so expensive, that it could not be economically used', he himself had devoted some experimental attention to variants of it. In 1872, when Mond returned from Belgium after seeing the Solvay process in operation there he found that a patent just granted to Weldon interfered with one of Solvay's patent claims. To this patent (BP 1539/1872) Mond lodged a successful objection, although, in fact, he wasted seven guineas thereby, since Weldon's proposal could not have been operated under the actual conditions of ammonia-soda manufacture! Apart from his numerous modifications of his original chlorine process, Weldon's inventive activity had little impact on heavy chemical technology.

To the end of his short life Weldon remained essentially an amateur; he never embarked on manufacture in the industry which so fully engaged his interest and of which he became one of the most important personalities as a publicist of its progress. Weldon's status in the industry was recognised by his election to Fellowship of the Royal Society in 1882. Writing to a speaker who had referred to him as a 'trained chemist', Weldon said: 'It was a mistake to quote me as an example of a "trained chemist". I never heard a chemical lecture in my life'.

Like most of the leading men in the Leblanc chemical industry, Weldon was reluctant to accept the possibility of the old technology being seriously threatened by ammonia-soda manufacture—he died before the threat of electrolytic chlorine was on the horizon. In the last few years of his life Weldon devoted much time to advocating steps by which the economy of the Leblanc processes could be maintained competitive with the new method of soda-making. Weldon, however, unlike most of his Leblanc contemporaries, suspected that the old system could not survive indefinitely.

Although of robust appearance and of energetic habits, Weldon suffered much from ill-health, particularly during the later years of his life. The long journeys, which he frequently had to make on the Continent and elsewhere in connection with his process company and the general affairs of the chemical industry, overstrained his constitution, causing him to suffer from severe attacks of palpitation and headache. In the early autumn of 1885 his doctor ordered him 'to do no work on pain of almost instant death'. On 20 September he died of heart failure at his home, Rede Hall, Burstow, in Surrey, at the age of 53.

PEOPLE in the news

● It was announced on 22 October that SIR HARRY RAILING is to resign as chairman and joint managing director of General Electric Co. at the end of this month. Sir Harry, who has agreed to remain on the board, has been connected with the company for nearly 52 years.

MR. LESLIE GAMAGE, vice-chairman and joint managing director, has been elected chairman and managing director from 1 November.

● MAJOR RICHARD MILES and SIR OWEN WANSBROUGH-JONES have been appointed part-time members, for three years, of the National Research Development Corporation. The part-time appointments of PROFESSOR P. M. S. BLACKETT, MR. J. F. LOCKWOOD and SIR ROWLAND SMITH have been renewed for a further two years, and that of SIR JOHN DUNCANSON for a further one year.

Major Miles is chairman and managing director of Head Wrightson and Co., a director of the Nuclear Power Plant Co. and other companies.

Sir Owen Wansbrough-Jones is Chief Scientist of the Ministry of Supply.

● In a statute promulgated in Congregation at Oxford on 22 October MR. ISAAC WOLFSON's offer of £65,000 to endow a Professorship of Metallurgy at Oxford University was accepted 'with deep gratitude'. Mr. Wolfson, 59, is chairman and managing director of Great Universal Stores.

● MR. T. C. JACKSON has been appointed local director (north-west area) of Croda. MR. L. G. WARREN has been appointed local director (Midlands area) and MR. J. M. CANNON, local director (North America).

● MR. JAMES CURTIS, formerly executive vice-president of the Lummus Co., has been appointed president of the Chemical Construction Corp., New York, which is affiliated to Chemical Construction (Great Britain) Ltd.

● Works manager of the Castner-Kellner works, Weston Point, Runcorn, MR. HENRY SHAW, has been appointed a technical director of the general chemicals division, ICI, in succession to DR. K. W. YOUNG who died recently while on holiday in Austria. In 1942 he became manager of the Rocksavage works and after two years was transferred to the technical department at Liverpool. His appointment at Castner-Kellner dates from 1946. MR. T. E. HOUGHTON, director and power department manager at Weston Point retires at the end of October. His successor is to be MR. J. HARRIS.

● MR. ARTHUR WADDINGTON has been appointed an executive director of Universal Metal Products Ltd. MR. E. G. WERTHEIMER is the managing director.

● At a meeting of the Institution of Mechanical Engineers on Friday, 18 October, MR. B. L. GOODLET, chief engineer and director of Brush Electrical Engineering Co., was awarded the Institution's premier award—the Thomas Hawksley Gold Medal. This is given to a member of the Institution for the outstanding paper of the year. Mr. Goodlet's paper on 'Nuclear reactors for power generation' won the award for 1957.

● MR. C. T. GOULD has relinquished his appointment as head of production study department, Unilever Ltd. Mr. Gould was trained as a technical and mechanical engineer and was initially engaged in research. He spent two years as a district technical sales engineer for Central London Electricity Ltd.; two years as general manager and secretary of the Case Development Co., and before his appointment to Unilever Ltd. on 1 July 1950, Mr. Gould was for eight years senior industrial consulting engineer with Production Engineering Ltd.

● SIR EDWARD THOMPSON, chairman and joint managing director of John Thompson Ltd., has been elected president of the British Engineers' Association. MR. A. I. BAKER, chairman of Baker Perkins Ltd., has been elected vice-president. The retiring president, MR. W. K. G. ALLEN, chairman and managing director of W. H. Allen, Sons and Co. Ltd., has been elected hon. treasurer.

● MR. R. J. BRAMHALL, of Rochdale, has been presented by the Manchester Junior Association of Gas Engineers with the silver medal of the North Western Gas Board, for his paper on electro-chemical corrosion.

● SIR GRAHAM HAYMAN, immediate past-president of the association of British Chemical Manufacturers, is chairman of the management committee of the Distillers Co. Ltd. In a caption on page 639 and on page 656 of last week's issue, Sir Graham was referred to as chairman, Distillers Co. Ltd. SIR HENRY J. ROSS is chairman of the board of directors.

● MR. G. F. SPICER has been appointed southern area representative for APV Paramount Ltd., the stainless steel and alloy steelfounders of Crawley. Mr. Spicer was previously a representative for K. and L. Steelfounders and Engineers Ltd., Letchworth.

● MR. R. E. C. TREWHITT, manager of the Cargo Fleet Coke Works, Middlesbrough, since May last year, has been appointed manager of Irlam Coke Works of the Lancashire Steel Corporation. Mr. Trewhitt began his career with the Fell Coke Works, Co. Durham, and later moved to Templetown Coke Works as an assistant manager. In 1943, he became assistant manager of the Fell Coke Works and held this appointment until his departure for Middlesbrough in May 1956.

● The Council of the Institution of Metallurgists announces that DR. A. D. MERRIMAN, who has been registrar-secretary for the past ten years, will retire.

Dr. Merriman will be succeeded on 1 January next by MR. R. G. S. LUDLAM, who has been assistant registrar at the University of Leeds since 1951. He is aged 36 and was educated at schools in South Africa, Southern Rhodesia, and King Edward VII School at Sheffield before graduating at the University of Sheffield.

Flame-Extinguishing Agents Surveyed in USAF Report

Results of a survey of the current state of knowledge of the physico-chemical means by which flames are extinguished are contained in a report of Air Force-sponsored research, PB 121853, 'Survey of fundamental knowledge of mechanisms of action of flame-extinguishing agents', R. Friedman and J. B. Levy, Atlantic Research Corp. for Wright Air Development Centre, just made available to industry through the Office of Technical Services, US Department of Commerce, Washington 25 DC, price $2.50. The report is based on pertinent scientific literature up to May 1956 as well as on visits to laboratories and investigators active in research on flames. The topics discussed include methods of flame-extinguishment, uninhibited and inhibited gaseous flames, the action of inhibitors, and the burning of liquids or solids including methods of inhibition. In particular, attention is devoted to flames of hydrocarbons, magnesium, carbon, and rocket-propellant chemicals. Special emphasis throughout the report is given to research findings of fundamental nature which might be helpful in planning future studies of the mechanisms of flame extinguishment. A bibliography containing 345 references is included.

Sunvic's Mobile Exhibition

A 35 ft. long articulated vehicle is being used by Sunvic Controls Ltd. as a mobile exhibition to demonstrate their range of instruments. The vehicle contains working display panels operated from a compressor in the vehicle. They show a Sunvic model 40 pressure regulator; the internal operation of a 50M controller, and the maintenance and adjustment of Sunvic plug-in controllers; section temperature and level transmitters; pressure regulators and controllers. Also on show is the 12-point demonstration data logger, and a selection of Sunvic pneumatic controlled instruments including booster precision and differential relays and valve positioners.

The vehicle will provide demonstration facilities additional to those on the Sunvic stand at Interkama, Dusseldorf, 2–10 November after which it will tour Holland and Belgium.

Commercial News

Over £7m. Applications for Monsanto Chemical's Deb. Issue

ON Tuesday, applications for over £7 million were received when £3 million 6 per cent debenture stock of Monsanto Chemicals Ltd., were offered at 95 by Lazard Brothers and Co. and Morgan Grenfell and Co. (see this page in last week's CHEMICAL AGE).

Preference and ordinary shareholders of the company will receive full allotment up to £1,000 and approximately 50 per cent above that figure. Allotment for other applicants is in full up to £200 and approximately 25 per cent over that level.

Letters of acceptance were posted on Wednesday.

According to Lex of the *Financial Times* the heavy applications suggest that the terms—6 per cent 1977–82 at £95 per cent—have proved acceptable. He remarks that these terms must now set the standard for similar issues, while fixed-interest yields remain as they are, although if the gilt-edged market continues to progress it may be possible for later comers to pare the discount a little.

Laporte Industries

An interim dividend of 5 per cent is to be paid by Laporte Industries on 30 November. The corresponding interim dividend last year was also 5 per cent. Total dividend paid last year was 16 per cent.

James Crean and Son

Soap manufacturers, etc., James Crean and Son (1936), report a net profit for the year ended 30 June 1957 of £4,365 (£4,895). Dividend for the year is 10 per cent (same).

Thermo-Plastics Acquired

Tootal Ltd. announce that they have purchased the whole of the share capital of Thermo-Plastics Ltd., of Dunstable, and of its associated company Plastra Components Ltd., of Welwyn Garden City. Thermo-Plastics was founded in 1932 by its present managing director, Mr. A. Reingand, who is to remain with the organisation, to manufacture display equipment from plastic sheets. During the war much pioneer work was done on the techniques of handling Perspex sheet to form large and complicated shapes such as aircraft canopies and radomes. Since then a policy has been followed of adding facilities to offer a comprehensive technical service in most branches of plastic production, fabrication and design, including a rapidly expanding section specialising in glass fibre/resin laminates.

This extension of Tootal interests into the field of plastics follows on the purchase of Vetrona Fabrics Ltd., a concern specialising in the manufacture and finishing of fabrics containing glass yarns. Tootal has collaborated with the West Point Manufacturing Co. of Georgia, US, in the production of non-woven fabrics by Lantor Ltd. The long-term future of each of these branches of production is inter-related in that they all depend, to some extent, on developments in the field of fibres and resins, so that each can benefit from the work of Tootal research organisation. Tootal has carried out extensive research in the application of resins to textiles over more than 30 years.

Pyrene of Australia

A subsidiary of the Pyrene Co. of England, the Pyrene Co. of Australia, has been registered with a nominal capital of £A200,000 as a preliminary step to establishing a fire extinguisher manufacturing plant at Melbourne. The company will be converted to a proprietary undertaking as some Australian capital is to be sought. Production at the plant should begin within 12 months, it is reported.

Beralt Tin and Wolfram

Production of 2,301 tons of wolfram concentrates and 169 tons of tin concentrates by Beralt Tin and Wolfram is recorded as being somewhat higher in the year ended 31 March last. Sales of concentrates realised £2,245,321 against £2,311,462. Net profit contracted from £426,200 to £325,574. The dividend was maintained, however, at 160 per cent. Due to heavier tax, current liabilities have risen from £625,345 to £1,143,277. The fall in price of wolfram is mentioned. According to the directors of Beralt Tin, however, the favourable average price of 274s 6d realised for wolfram was primarily due to the last of the company's long-term contracts at a fixed price. This contract expired on 30 September last.

It is reported also that following the establishment of a subsidiary, Beralt Tin and Wolfram (Sales) and other measures taken after consultation with the Inland Revenue, they are satisfied that the company is provisionally qualified as an overseas trade corporation.

Key Glassworks

Application has been made by Key Glassworks Ltd., to the London Stock Exchange for permission to deal in the £640,000 6½ per cent debentures 1978–82. The debentures are secured by a trust deed made between the company and Eagle Star Insurance as trustees. Net proceeds are estimated to amount to £589,600 and will be applied in repaying the company's bank overdraft of £571,767. Neither the company nor any of its subsidiaries has any other mortgages, debentures or other loan capital outstanding.

In the absence of unforeseen circumstances the directors consider that retained profits and depreciation provisions over the next two years should be sufficient to finance capital expenditure of approximately £300,000 required to complete the first stage of the Harlow development. Consolidated net assets as at 30 November 1956 were £2,091,200. With the addition of proceeds of the debentures, the total sum will be £2,680,800, sufficient to cover the principal amount of the debenture, four times over.

NEW COMPANIES

INCRUSTATIONS (1957) LTD. Cap. £1,000. Manufacturers of and dealers in charcoal and resinous gums, chemicals, etc. Director: J. W. Macher. Reg. office: 60 St. Paul's Churchyard, London EC4.

Market Reports

FAIR DEMAND FOR CHEMICALS

LONDON Overall demand from the home consuming industries has remained fairly steady with a good intake against existing contract commitments. In most sections spot demand is perhaps a little quieter whilst reports indicate that the volume of export enquiry in circulation is well up to recent levels.

Most of the soda products are in good call and there is a ready outlet for the potash compounds and for chemicals used in the plastics and rubber industries, while fertilisers are in fair demand on a firm price trend. Apart from the non-ferrous metal compounds, the price position generally is steady and firm. There has been no outstanding feature on the coal-tar products market and in most sections supplies are adequate to meet requirements. Creosote oil and cresylic acid are both active items on home account and for shipment, and pitch continues in good request.

MANCHESTER The demand for textile chemicals on the Manchester market during the past week has been described as fair, but with the exception of one or two other outlets whose requirements have eased off to some extent, the movement into consumption in the home section has been maintained at a reasonably good level. Shippers' enquiries for the soda compounds and a number of other lines are also keeping up reasonably well. Basic slag and the compounds are busy sections of the market for fertiliser materials. On the whole, a steady demand for most of the tar products continues to be reported.

GLASGOW The past week has been one of increased activity in the Scottish market, where both demands and enquiries have been numerous and covered, not only immediate, but forward requirements. These were from quite a cross-section of industry, and for a varied range of chemicals. Quite a demand is still being maintained in the overseas market, with the usual volume of enquiries. On the whole, prices have been firm, with some slight variation in certain directions.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £136.

Alum, Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18 10s.

Ammonia, Anhydrous. Per lb., 1s 9d to 2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £27 to £30 2s 6d.

Ammonium Nitrate. D/d, in 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 7d to 5s 0½d; golden, 2s 10½d to 4s 3½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £66; gran., £45; crystal, £47 10s; powder, £48 10s; extra fine powder, £49 10s; BP, gran., £51; crystal, £56 10s; powder, £57 10s; extra fine powder, £58 10s. Most grades in 6-ply paper bag, £1 less.

Boric Acid. Ton lots, in hessian sacks, c.p. Tech., gran., £74 10s; crystal, £82 10s; powder, £80; extra fine powder, £82; BP gran., £87 10s; crystal, £94 10s; powder, £92; extra fine powder, £94. Most grades in 6-ply paper bag, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2½d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £10 15s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 3s 3d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £73.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £89.

Glycerine. Chem. pure, double distilled 1,260 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 2s 6d per lb.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 4d; for 1-cwt. lots, per lb., 13s 5d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Iodoform. Under 1 cwt., per lb., £1 2s 11d, for 1-cwt. lots, per lb., £1 2s 3d.

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £115: orange lead, £127. Ground in oil: red, £135, orange, £147.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £124 15s; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £117.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 9s 3d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £129.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb. 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2¼d.

Potassium Iodide. BP, under 1-cwt., per lb., 10s 3d; per lb. for 1-cwt. lots, 9s 9d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 8½d.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack., £16 10s.

Sodium Bisulphite. Powder, 60/62%, d/d, 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots. about £85.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1¾d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 14s 1d; 1-cwt. lots, per lb., 13s 2d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. D/d UK in 1 ton lots, 1 cwt. free paper bags, £27 10s.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., £29 10s.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, ton lots, £145 15s.

Sodium Percarbonate. 12½% available oxygen, per cwt., in 1-cwt. kegs, £8 10s 9d.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, £18 10s to £18 15s.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £9 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £11-£12 12s 6d; 140° Tw., arsenic free, £9 2s 6d; 140°Tw., arsenious, £8 14s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14; 1 cwt., £14 5s.

Titanium Oxide. Standard grade comm., rutile structure, £182; standard grade comm., anatase structure, £167.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £90; green seal, £88; red seal, £85.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128 in 10-gal. drums, £118; in 40-45-gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £152.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45-gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £177; 10-gal. drums, £167. 40/45-gal. drums: under 1 ton, £142; 1-9 tons, £141; 10-50 tons, £140; 50-100 tons, £139; 100 tons and up, £138.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £225; 45-gal. drums, d/d, per lb., 2s 1d.
Diethyl Phthalate. In drums, 10 tons, per ton, £221; 45-gal. drums, d/d, per lb., 2s 0½d.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £200, 45-gal. drums, d/d, per lb., 1s 10½d.
Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 2s 1½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 3s 1½d. D/d in 40/45-gal. drums, p.p.g. extra, 1d.
Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 4d; 100-499 gal. in drums, d/d, per gal., 5s 8½d. Pyridinised 64 o.p.: 500 gal. and up, in tankers, d/d, per gal., 5s 6d; 100-499 gal. in drums, d/d, per gal., 5s 10½d.
Methyl Ethyl Ketone. All d/d. In 5-gal drums, £183; in 10-gal. drums, £173; in 40-45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40-45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40-45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. Per lb., according to packing, 8d-1s.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 8½d to 2s 0½d; dark, d/d, per lb., 1s 3d-1s 5½d.
Lithopone. 30%, about £59.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL-TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s 1d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 17s 6d-20s.
Toluole. Pure, per gal., 5s 9d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s.
MANCHESTER: Pure, naked, per gal., 5s 7½d.
Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 2d-6s 6d.

INTERMEDIATES AND DYES

(Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.
o-**Cresol** 30/31°C. D/d, per lb., 1s.
p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb., 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.
p-**Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.
Nitronaphthalene. Per lb., 2s 5½d.
o-**Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.
p-**Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Chemical Stocks & Shares

MARKETS REMAIN UNSETTLED

Price Fluctuations of Borax Deferred

OVER the last two weeks markets generally have had a see-saw effect on prices with no very marked tendency. The spotlight has been thrown on the sterling rate against the dollar, which has been above parity several times, towards the end maintaining 2.80½. This trend seems to support the Government's last bank rate increase to 7 per cent and, providing the international front remains on an even footing, inflation, at least for the time being, seems to have been halted.

Otherwise movement, apart from one or two of the leading chemical companies, has been restricted. Borax Deferred, due to attempted buying in the US, have varied between 23s and a new 1957 low of 20s 3d, finishing around 20s 7½d. ICI Ltd. continued dull, reacting to 37s 6d in general with other industrial sections. Dealings began on A. Boake, Roberts 8 per cent 1st Mortgage debenture at 100¾ and remained steady at 101¼, while among plastics British Xylonite were 1s down at 29s 6d.

A main event this week has been the success of the Monsanto £3 million debenture issue, details of which are reported on p. 693.

1957 High	1957 Low		22 Oct.	Change on last two weeks
23/7½	17/-	Albright & W. 5/-	17/-	—6d
11/6	10/6	Anchor 5/-	11/6	+9d
1/3	1/-	Ashe 1/-	1/1½	—1½d
24/6	20/-	Bakelite 10/-	21/9	+7½d
7/10½	5/-	Berk 5/-	5/-	—1½d
36/-	20/3	Borax 5/- Dfd.	20/7½	—1/4½
10/9	9/-	Bt. Chrome	5/-	—3d.
13/10½	10/3	Bt. Glues 5/-	10/7½	—3½d
6/4½	4/9	Bl Plast. 2/-	5/1½	—7½d
8/6	5/6	Bt. Tar 2/6	6/9½	—8½d
22/3	17/6	Brothertons 10/-	18/-	+3d
35/-	27/3	Bt. Xylonite	29/6	—6d
4/4½	3/6	Coalite 2/-	3/6	—6d
60/3	47/6	Fisons	47/-	—6d
43/-	24/-	Glaxo 10/-	31/10½	—2/3
9/6	8/-	Hardman & H. 5/-	8/-	—7½d
34/6	24/1½	Hickson & W. 10/-	29/6	—3d
46/3	37/6	ICI	37/6	—2/-
4/9	2/7½	Kleeman 1/-	2/9	—3d
22/1½	15/-	Laporte	15/3	+3d
22/-	16/3	Lawes 10/-	16/3	—1/6
19/3	12/4½	Monsanto 5/-	13/6	—4½d
15/6	11/6	Reichhold	11/6	—1/4½
11/9	9/-	Yorkshire Dye 5/-	10/-	—3d

US Adhesives Developments

Developments in research on elevated temperature-resistant, inorganic polymer structural adhesives suggested the use of completely inorganic materials other than ceramics as high-temperature, metal-to-metal adhesives. H. H. Levine (report PB121908, obtainable from the US Office of Technical Services, US Department of Commerce, Washington 25, DC. US 75 cents) obtained an inorganic adhesive, stable at 800°F. with room temperature shear strength of 285 lb./sq. in. from ammeline-phosphorus pentoxide reaction product. Titanium dioxide priming of steel increased the bond strength from an original value of 65 lb./sq. in. Dimethylformamide was used as an extractive solvent.

It is stated that adhesion was apparently the result of chemical interaction between the adhesive and the surface of the stainless steel. Increased pressure during cure resulted in stronger bonds.

In report PB121856, J. M. Black and R. F. Blomquist of the Forest Products Laboratory, US Department of Agriculture, give details of an experimental phenol-epoxy resin tape adhesive (FPL-878). The liquid form of this metal-bonding adhesive has shown high heat resistance up to 600°F. The tape form, supported by glass mat carrier, produced better bonding of sandwich material, but lacked resistance to long-time heat ageing at high temperatures shown by the liquid form. The best supporting medium was found to be glass cloth with a heat-cleaned or Volan A finish. Aluminium bonds made with the glass-cloth tape adhesive were found to resist heat ageing better than other tape modifications using glass fibre mats, glass cloth treated with resin primers and metal naphthenate, etc. Inorganic and metallic fillers were added to the tape adhesive without detracting from the thermal resistance of the bond.

FOR YOUR DIARY

MONDAY, 28 OCTOBER

Manchester Literary and Philosophical Society—Manchester; The University, Percival lecture, 'The limits of physical measurement' by Prof. S. Devons.

Incorporated Plant Engineers—Leeds University; 7.30 p.m. 'Thermoplastics, their application in tube manufacture and usage' by J. Alfred.

TUESDAY, 29 OCTOBER

Parliamentary and Scientific Committee—London; House of Commons. 5.30 p.m. Meeting of general committee, 'The present and future of medical research in the tropics' by Sir Harold Himsworth.

Society of Cosmetic Chemists of Great Britain—London; 'Gas-liquid chromatography' by Dr. A. J. P. Martin.

Plastics Institute—London; National College of Rubber Technology, N7. Junior lecture, 'Physical testing of plastics' by W. J. Pullen.

Royal Institute of Chemistry—Chatham; Medway College of Technology, Maidstone Road. 7 p.m. 'Colour in organic chemistry' by Prof. M. J. S. Dewar.

Institution of Chemical Engineers—Chester; North Western Branch, Blossoms Hotel. 7 p.m. 'Some aspects of the large scale use of irradiation in industry' by B. Roberts.

WEDNESDAY, 30 OCTOBER

Society for Analytical Chemistry, Scottish Section—Glasgow; Central Hotel. 7.15 p.m. 'Estimation of additives to bread and flour' by J. Sword.

Society for Analytical Chemistry—London; 6.30 p.m. 'British standards in microchemistry' discussion opened by C. Meredith and G. Ingram.

FRIDAY, 1 NOVEMBER

Royal Institute of Chemistry—London; St. Ermin's Hotel, Caxton Street, SW1. 7 p.m. Ninth annual dinner and dance.

Royal Institution—London; 21 Albemarle Street, W1. 9 p.m. 'Clean air—what we know and what we do not know' by Sir Hugh Beaver.

New Atomic Patents Available Shortly

SPECIFICATIONS of three patents developed within the UK Atomic Energy Authority are about to become generally available. They are all connected with the design of the graphite structure used in the building of Calder Hall nuclear power station.

Purpose of the graphite within the reactors of this station, as in the power stations to be set up, is to act as a moderating material which slows down neutrons released by fission to a speed which ensures the maintenance of the reaction. At Calder Hall, 1,200 tons of high purity graphite are used in each reactor, in the form of nearly 60,000 blocks.

Influencing the design of graphite moderators is a number of factors, one of the most important being the phenomenon of growth under irradiation (generally referred to as Wigner growth) which is affected by the quality of graphite, the direction of grain, neutron bombardment and temperature.

The patents involved, which also include details of fuel element support, are: Nos. 784,291 and 784,292, both open for inspection from 9 October, and No. 785,876 open for inspection from 6 November.

Specifications can be obtained from the Patent Office (Sales Branch), 25 Southampton Buildings, London WC2, at 3s 6d a copy, including postage.

TRADE NOTES

Industrial Engineering

The formation of two new companies in which Industrial Engineering Ltd. shares a half interest with overseas companies is announced. One is Industrial Oxygen, formed to manufacture and distribute a range of industrial and medical gases in Australia. Initial paid-up capital is £A450,000. The partner is L'Air Liquide, of France.

Harris Calorific Australia Pty. is the second company formed in conjunction with the Harris Calorific Co., US, having an initial capital of £A50,000.

Portable Resuscitator

British Oxygen Gases Ltd. are now marketing a portable resuscitator—the Minuteman—which should prove of value in preventing deaths from gas poisoning, electrocution, overdose of drugs or drowning. The machine weighs only 28 lb. and can be carried quickly to the scene of an accident. The maker describes it as robust, simple in operation and as requiring less skill and energy than other modern methods of resuscitation. If necessary the machine can be made to act as an inhaler delivering oxygen-enriched air to the conscious patient while two midget resuscitation face masks can work from the same source.

PTFE Gasket Shield

Another use for p.t.f.e. (polytetrafluoroethylene) the new synthetic material derived from ethylene in which the hydrogen atoms have been replaced by fluorine, has been found at the Dunlop factory at Cambridge Street, Manchester. There p.t.f.e. gasket shields are being made for the chemical and glass industries.

In many chemical processes glass piping is the only material that will withstand the action of certain corrosive liquids. Until now it has been difficult to find a gasket joint between the pipe flanges that is both resilient and resistant to corrosion. The new gasket shields, consisting of a thin p.t.f.e. envelope, protect the bore and both faces of the gasket, and are claimed to offer complete chemical resistance without detracting from the resilience of the rubber gasket.

Appointed Exclusive Agents

Omni (London) Ltd., 35 Dover Street, London W1, have been appointed exclusive agents for the J.T. Baker Chemical Co., Phillipsburg, New Jersey. The US company manufactures a wide range of fine and industrial chemicals, which includes molybdenum chemicals and aluminium hydroxide.

New Stockyard

Staveley Iron and Chemical Co. Ltd. has opened a new office and stockyard for the south-western area. The address is The Staveley Iron and Chemical Co. Ltd., Denver Road, Topsham, near Exeter. Tel. No. Topsham 4123.

Reagents by BDH

Following the introduction by British Drug Houses Ltd., Poole, of four reagents for gas chromatography; dimethyl phthalate, form-dimethylamide, hexamethyltetracosane and tritolylphosphate, the company have added two stationary phases and prepared grades of Celite. They are diethyl-digol (ethyl carbitol; diethylene glycol diethyl ether) and dimethyl sulpholane.

Publications Received

'Protection Against Corrosion and Chemical Attack'. Catalogue of stocks of polythene, p.v.c., nylon, Fluon and information on fabrication work. Industrial and Marine Protective Applications Ltd., Barnbrook Works, Fountain Street, Barnbrook, Bury.

'Dust Collection and Fly Ash Elimination; The Buell Micro-lector (Van Tongeren) System'. Buell (1952) Ltd., 3 St. James's Square, London SW1.

'Mobil Etna SS Oils in the Linen Industry'. Mobil Oil Co. Ltd., Caxton House, Westminster, London SW1.

'Foscote for Cold Brush-on Application'. Walterisation Co. Ltd., Purley Way, Croydon, Surrey.

'Pressure Switches, Vacuum Switches for all Industrial Purposes'. Londex Ltd., Anerley Works, London SE20.

'Aluminium Treadplate—Positive-Grip-Pattern'. British Aluminium Co. Ltd., Norfolk House, St. James's Square, London SW1.

'Geon Resins for Gramophone Records'. British Geon Ltd., Devonshire House, Mayfair Place, Piccadilly, London W1.

'Portable Current Density Indicator', 'Switchboard Instruments, Moving Iron Type', 'Rotary Synchroscopes'. English Electric Co. Ltd., Stafford.

'Chemical Research'. Describing research within Thomas Hedley and Co. Ltd., Newcastle-upon-Tyne.

'Alloys Metals Review (September 1957)'. Sprayed Molybdenum and its applications. High Speed Steel Alloys Ltd., Widnes, Lancs.

'Hiduminium (RR 58)—the aluminium alloy sheet for high temperature applications'. High Duty Alloys Ltd., Slough, Bucks.

'Alkylated Melamine Formaldehyde Resins for Surface Coatings'. British Oxygen Chemicals Ltd., Vigo Lane, Chester-le-Street, Co. Durham.

'Resistance Heated Vacuum Furnace Model 2904 (Laboratory Use)'. Wild Barfield Electric Furnaces Ltd., Elecfurn Works, Otterspool Way, Watford, Herts.

'Bakelite Moulding Materials, complying with BS and Government Specifications (5th edition)'. Bakelite Ltd., 12-18 Grosvenor Gardens, London SW1.

'Specialist Building Materials for Roofing'. British Bitumen Emulsions Ltd., Dundee Road, Trading Estate, Slough, Bucks.

'The Brazing of Aluminium and its Alloys'. The Aluminium Development Association, 33 Grosvenor Street, London W1. Price 2s.

'Tubular Sections'. Catalogue of special tubular steel sections made by Accles and Pollock Ltd., Oldbury, Birmingham.

'Pressure Reduction' (140), 'Desuperheating' (141), 'Pressure Reduction and Desuperheating' (142). Three leaflets from James Gordon and Co. Ltd., Dalston Gardens, Stanmore, Middx.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London, WC2, price 3s. 3d. including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMMENDED SPECIFICATION

On sale 27 November or as soon as possible thereafter

Oxo synthesis. Standard Oil Development Co. **690 977**

ACCEPTANCES

Compositions of acrylonitrile polymers. Chemstrand Corp. **787 060**

Preparation of spinning solutions of cellulose triacetate. Celanese Corporation of America. **786 819**

Vinyl ethers of substituted biurets, their polymers, and their preparation. Rohm & Haas Co. **787 045**

Production of styrene oxide. Deutsche Gold- und Silberscheideanstalt Vorm. Roessler. **786 731** and **786 732**

Halophenoxysiloxanes and halophenoxysilanes. Midland Silicones Ltd. **787 046**

Gas mixture fractionating apparatus. Naamlooze Vennootschap Philips Gloeilampenfabrieken. **786 922**

Thiaxanthone quinone. Farbenfabriken Bayer AG. **786 925**

Process and apparatus for the calcination of alkali metal bicarbonate. Chemiebau Dr. A. Zieren GES. **786 825**

Unsaturated polyester. United States Rubber Co. **786 926**

Process for the manufacture of carbon black. United Carbon Co., Inc., Maryland. **786 730**

Processes for the manufacture of heat insulating refractories. Fujii, K., and Ishido, Y. **786 995**

N - vinyloxyalkyl - alkanecarboxamides. Rohm & Haas Co. **786 927**

1, 2 cobalt-complexes of monoazo-dyestuffs. Sandoz, Ltd. **786 928**

Quaternary ammonium salts of thiazole monoazo dyestuffs. Geigy AG. **786 929**

Producing N-methyl-*a*-phenylsuccinimide. Parke Davis & Co. **787 061**

Production of copolymers. Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. **787 062**

Process of preparing phthalic acids by oxidatjon of dialkyl benzenes. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **786 930**

Reforming gasoline hydrocarbons. Universal Oil Products Co. **786 835**

Purification of crude aqueous hydrogen peroxide. Du Pont De Nemours & Co., E. I. **786 838**

Substituted hydroxy-ergolenes and their preparation. Lilly & Co., E. **786 939**

Process for polymerising organic compounds. Deutsche Gold- Und Silberscheideanstalt Vorm. Roessler. **786 843**

Preparation of hydrogenation catalysts and hydrogenation processes using such catalysts. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **787 049**

Carbinol and salts thereof and a process for the manufacture of same. Hoffmann-La Roche & Co. AG., F. **786 944**

Derivatives of glycinamide and a process for the manufacture thereof. Hoffmann-La Roche & Co., AG., F. **787 066**

Production of delta-epsilon-unsaturated carboxylic acids, their derivatives and the corresponding delta-valerolactones. Badische Anilin- & Soda-Fabrik AG. **786 945**

Hexahydrotetralic esters, their preparation and their uses. Soc. des Usines Chemiques Rhone-Poulenc. **786 948**

Arrangement for mixing under varying pressure one liquid with another liquid in a definite ratio of quantity. Aktiebolaget Separator. **787 004**

Organosilicone compounds. Midland Silicones, Ltd. **787 067**

Lubricating compositions containing polyoxy alkylene liquids. Shell Research, Ltd. [Addition to 703 445.] **786 950**

Method of making a glass article of high mechanical strength and article made thereby. Corning Glass Works. **786 951**

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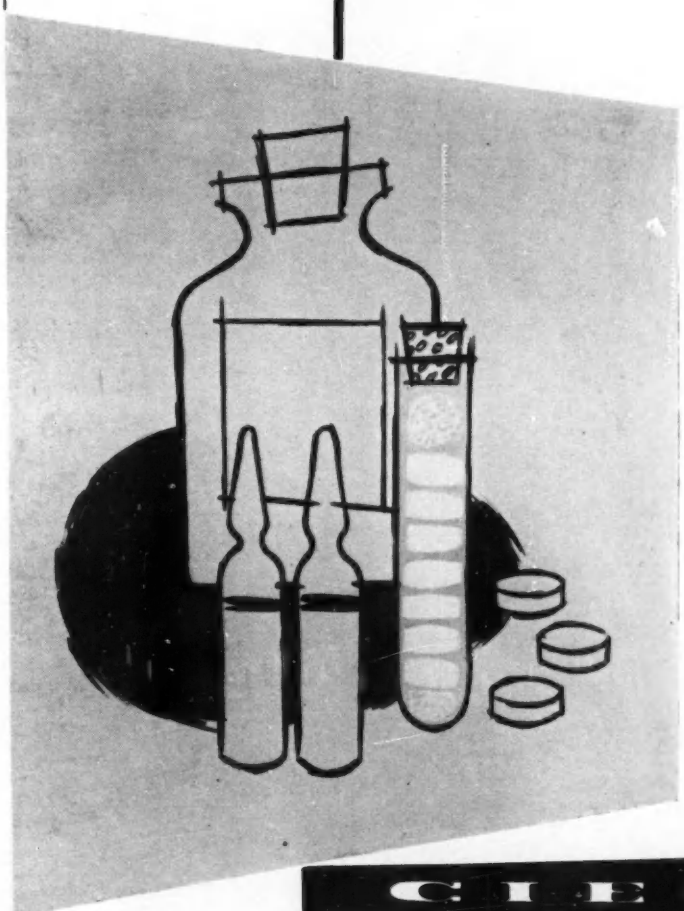

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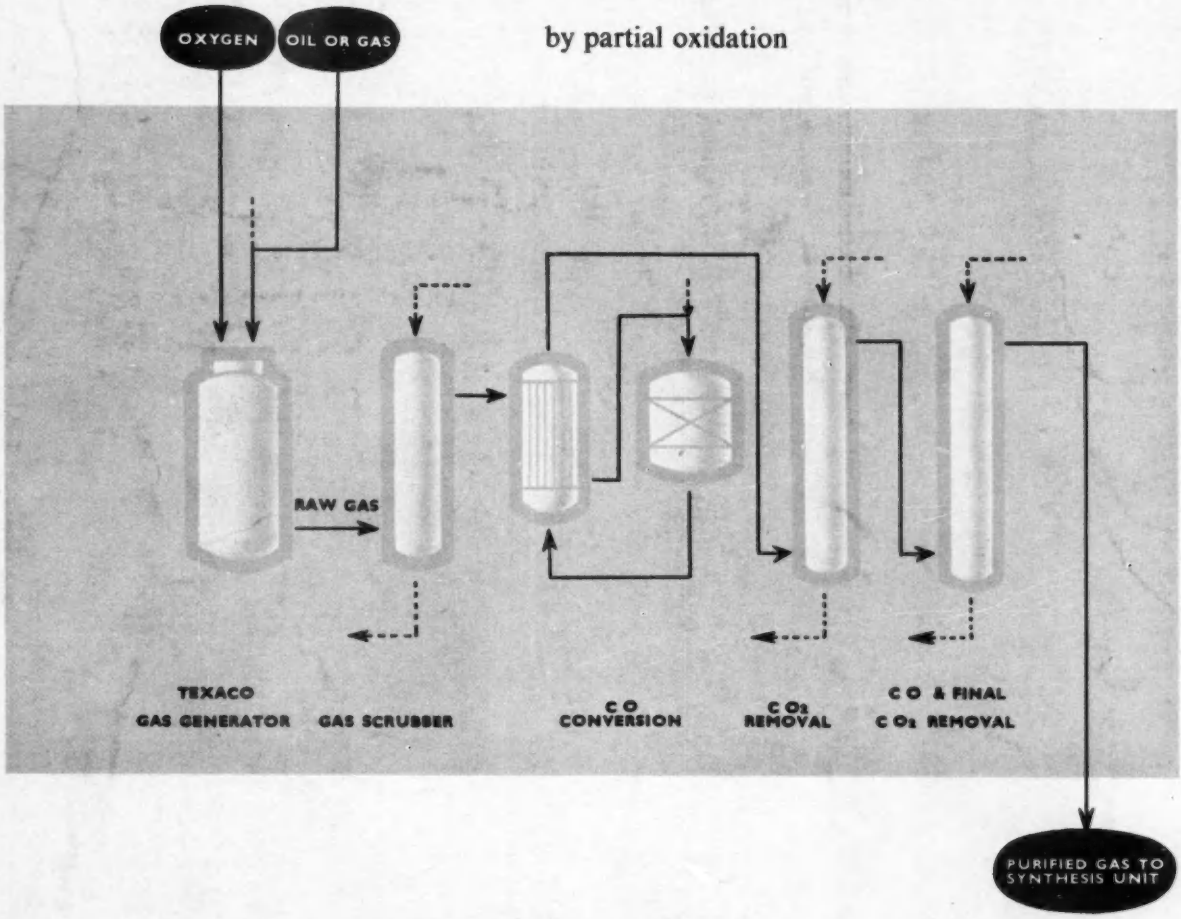

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